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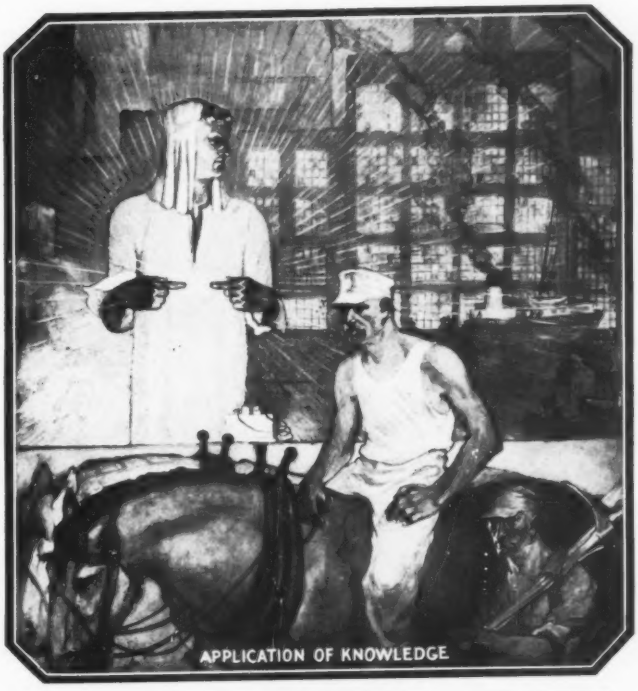

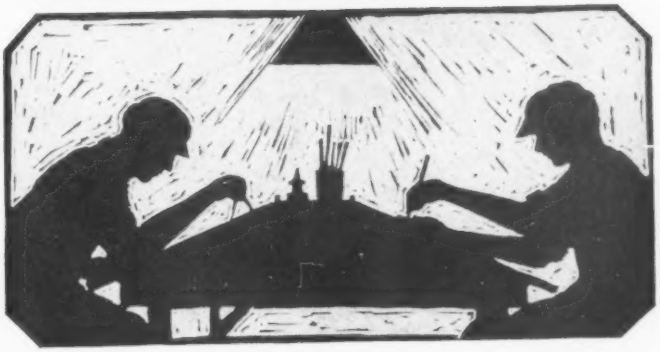

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PREPARE NOW

This is the time to lay your plans for attendance at either or both of the conventions which next claim the attention of directors, supervisors, and teachers of the manual arts, and vocational and industrial education.

The Eastern Arts Association will hold its twentieth annual convention April 2 to 5 in New York City.

The Western Arts Association will hold its thirty-fifth annual convention April 30 to May 3 at Cleveland, Ohio.

THIS MONTH'S COVER

The picture on the cover of the March issue of the INDUSTRIAL-ARTS MAGAZINE is a reproduction of one of a pair of large murals painted for the Dearborn Public Library, Detroit, Mich., by Paul Honore. This gifted painter of murals also is known as a maker of wood blocks.

(The articles contained in the Magazine are regularly indexed in "The Reader's Guide to Periodical Literature," and "Current Magazine Contents.")

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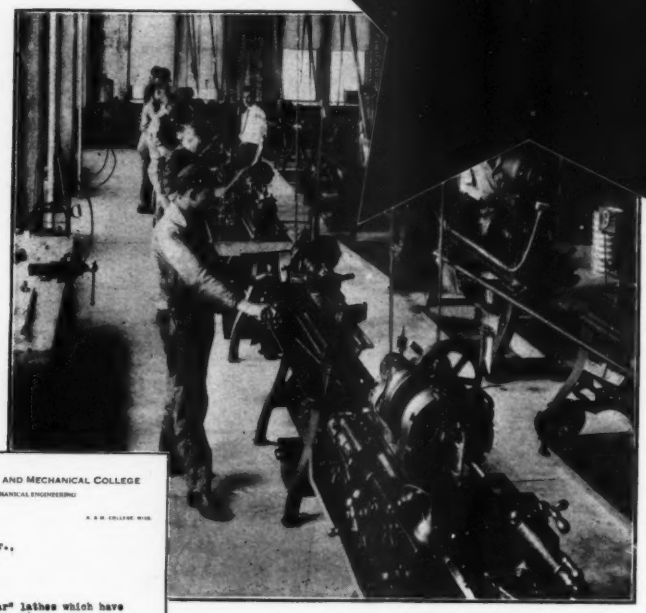

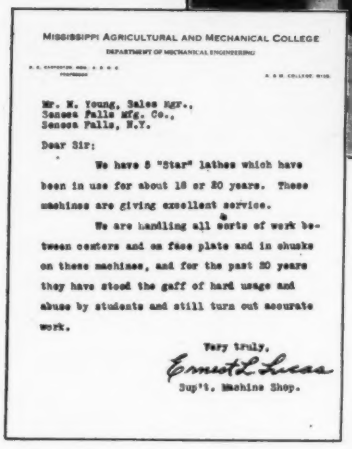

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THE INDUSTRIAL-ARTS MAGAZINE

Volume XVIII MARCH, 1929 NO. 3

The Attitudes and Outlook of Industrial-Arts Teachers[1]

Arthur B. Mays, Professor of Industrial Education, University of Illinois, Urbana, Ill.

THE successful practice of any vocation involves three essential factors; namely, skill, knowledge, and appropriate attitude. Skill divorced from knowledge and desirable vocational attitudes is valueless since one must know when and where to exercise skill, else it is of no avail. In like manner knowledge is helpless without skill, and attitude is meaningless unless supported by skill and knowledge. Yet all too often programs of vocational education fall short of providing adequately for the development of all three, being content, usually, to give skill and knowledge, trusting to occupational experience to produce the needed attitudes. Occupational life may or may not cause one to assume desirable attitudes. The growth of appropriate, habitual attitudes and outlook is too important an element in vocational competency to leave to chance and all vocational training schemes ought definitely and effectively to provide for it. Appropriate attitudes and outlook are important at every occupational level but they are of greater relative significance in the professions than in other callings. Of all the professions, the absence of desirable attitudes is most deplorable in teaching. The vocation charged with the responsibility of training youth to understand life and to play a constructive, progressive part in the maintenance and evolution of civilized society, of all the vocations, ought itself to possess those attitudes which are conducive to such ends. This clearly is true of the teachers of the industrial arts no less than of those of the other phases of modern education.

The exact nature of attitudes is not clearly understood. They seem to be of the same stuff as ideals, when considered from the point of view of their essential character, and to be much like habits, when thought of as "controls" of conduct. Strictly speaking, however, it is inaccurate to define them either as ideals or habits. Just what they are psychologically is not known, but in general, their characteristics are understood. Perhaps their most obvious quality is their emotional nature. Attitudes seem to be essentially emotional. One's attitude toward anything is known usually by his immediate emotional response to that thing. Probably because of this, and the fact that they are developed by no conscious effort on the part of their possessor they seem to be so deep-seated that they appear innate and unchangeable. Attitudes can change, however, and can be developed. They seem to be acquired from experiences; through imitation; from the conscious expression of ideals in conduct; and by definite decision to assume certain viewpoints as result of new knowledge gained or of response to a direct emotional appeal. These modes of acquisition suggest that the schools may play a large part in developing desirable attitudes in their pupils. The atmosphere of the school may be controlled so as to conduce to the attitudes desired; the experiences to which the pupil is subjected, both in and out of class, may be directed so as to contribute to specific attitudes; the attitudes of teachers and other pupils exert considerable influence; and the direct appeals of teachers for the express purpose of creating certain attitudes in the pupils can effectively be employed. Hence, it seems within the power of teacher-training agencies to contribute much toward the development of desirable vocational attitudes in their students. Much more attention needs to be given this aspect of teacher training than usually is given to it, and there is great need for study of specific methods of developing particular attitudes. However, much may be accomplished with present knowledge of the subject if the instructor of student-teachers will deliberately and continuously try to build up the attitudes he knows to be desirable for teachers to have. Those in training to become industrial-arts teachers stand in great need of such help and a prominent place should be given to this phase of their training.

What, then, are the attitudes and what the outlook which the industrial-arts teacher ought to have? For convenience let us think of his attitudes as falling under these heads: (1) attitudes toward his vocation, (2) attitudes toward himself as a member of a great calling, (3) attitudes toward his pupils, (4) attitudes toward his colleagues and their work, and (5) attitudes toward society. His outlook is his view of his place in the scheme of things both as a man and as an industrial-arts teacher. Both his personal advancement and the effectiveness of his work in the lives of those he touches are dependent largely on whether these attitudes and his general outlook are appropriate and desirable.

First, his attitude toward his vocation should be one of pride and pleasure. It is not enough that he be not ashamed of his occupation, he should have and

[1]Revision of a paper read before the Industrial-Arts Section, American Vocational Association, Philadelphia, December, 1928.

express genuine pleasure and pride in his calling. How unhappy one must be who is not proud of his life-profession! What a handicap such an attitude is! The lack of occupational pride explains in no small degree the lack of growth and the monotonous mediocrity of the professional life of many a teacher of the industrial arts. The requisite pride is not an unwonted egotism, but that which is based on a broad knowledge of the social meanings—the origins and trends of his occupation. Hence the basic factor in the development of professional pride is a comprehensive knowledge of the history, the present significance and the probable future development of the industrial arts. Teacher-training institutions err greatly when they fail to give the requisite time and effort to the teaching, in a vital, interesting manner, of the historic, social, economic, and educational background of industrial-arts education and when they neglect to lead their students to a clear understanding of the social and educational importance as well as of the place in the school program of this field of teaching. Such knowledge and appreciation are indispensable to a proper attitude, yet how few teachers seem to have acquired them! But this is not quite enough. Deliberate efforts must be made through inspirational talks, through professional associations and, not least, through continuous example by the one training the teachers, to inform and develop the spirit of pride which begins to reveal itself as the student's knowledge of the significance of industrial-arts teaching grows from day to day.

The attitude of one toward himself as a teacher of the industrial arts should be that of a worthy member of a great vocation. This comes through a feeling of mastery of the techniques and the related technical and professional knowledge peculiar to the field. It also involves a keen sense of responsibility to uphold the highest standards of workmanship as a member of the craft. Obviously, this means thorough training. There is no substitute for careful, intensive training if one would attain genuine mastery of his subject. Without a consciousness of mastery one cannot have proper professional self-respect. Teacher-training agencies, therefore, owe to their students a rigid insistance on high standards of work and a constant discouragement of all tendencies toward superficiality. Industrial arts during many years suffered the consequences of superficial teacher training and not the least of such consequences was a rather general lack of vocational self-respect on the part of its teachers. This unfortunate attitude of our teachers was invariably reflected in the general attitude of the teachers in the other fields of general education toward the industrial-arts teacher, and the work suffered all along the line as a consequence.

Mastery also leads to a proper feeling of duty to uphold high standards of teaching efficiency and causes one to be interested in helping to raise standards generally. The people who protest against the raising of standards for teachers are almost invariably those who are conscious of their inability. Short cuts, relaxation of requirements, and special concessions which lead to an easy obtaining of requisite certificates, diplomas, or other presumable recognition of accomplishment deceive few and least of all the recipient. The result is a guilty realization of unworthiness with the inevitable wrong professional attitude.

The attitude of a teacher toward his pupils, partly grows out of a native bigness of character, or lack of it, and partly of a clear understanding of the proper function of the teacher. Student teachers very much need to be taught the meaning of teaching. Is teaching merely a means of making a living or is it chiefly a highly specialized, very significant mode of social service? The attitude of a teacher toward his pupils depends in large measure on the answer he gives to himself of this question. Most poor teaching is caused *not by lack of knowledge*, but by a *wrong attitude* toward those being taught. There is a vast difference between an animated reference book and a teacher. One gives facts; the other leads, guides, encourages, restrains, stimulates, that is to say, teaches. One is cold, accurate, perhaps just, usually feared; the other is sympathetic, understanding, always trusted and marvelously effective in producing desirable and permanent results in the pupils' lives. Thus teacher training which fails, through example and precept, to develop the genuine teacher attitude performs not more than half its task when it turns out a technical expert who lacks the proper attitude of the teacher with respect to his pupils.

The industrial-arts teacher, whatever the provocation, who assumes an antagonistic attitude toward his colleagues in the other departments of his school, and assumes either a pose of contempt or an attitude of indifference to the academic phases of general education, hurts both himself and his field of work. He cannot afford to permit any to excel him in his love of all "knowledge that is of the most worth." This means he must be broadly educated at least to the point of being continuously interested in science, literature, history and the other phases of liberal learning. To have any other attitude, brings contempt upon his own subject from both his fellows and his pupils. Nothing more quickly and surely brands one as a bigot, stupidly ignorant of the finest aspects of human life than for him to profess a contempt for the fine and the liberal arts. Hence teachers of the industrial arts should be equipped with scholarly interests as an important part of their professional preparation, to insure at least a wise attitude toward their colleagues of the other phases of general or cultural education.

Toward society, the teacher of the industrial arts, because of the great social value of his subject, if for no other reason, should have a keen sense of responsibility. In a world made up so largely of industrial factors as the present-day world is, boys and girls, to live freely and effectively, must have an understanding of those vital factors. It is the business of the industrial arts to interpret contemporary industrial work and life to the youth who presently are to participate in and control that work and life. Hence the industrial-arts teacher plays a most important rôle in modern society. If he fails to realize this, he not only misses a great source of enthusiasm and motivation in his work, but he also loses much of his effectiveness as a constructive social agency. To under-

stand adequately this rôle, he must acquaint himself fully with the problems and practices of modern industry and think of his work as something vastly more important than the mere teaching of a few tool skills and a few technical facts. His is the work of an interpreter of a most significant aspect of modern life, and a proper social attitude on his part depends on his realization of this fact. This should be clearly pointed out to him during his training period and his technical education should be such that he will be able both to understand and to transmit the facts of industrial economics to that end.

All of the five special attitudes here enumerated are mutually dependent and closely related. One aids in developing another and their mere enumeration and definition will aid one in their acquisition. All, together, likewise lead to the desirable point of view, or outlook, of the high-grade industrial-arts teacher. Possessing these attitudes and doing the kinds of work they imply will inevitably produce the outlook which indicates a consciousness of being one of society's most important servants. Such a teacher is proud of his vocation, happy in his work, considerate and efficient as a leader of youth, sympathetic with and deeply interested in the work of his colleagues, and fully aware of the importance and the responsibility of his place in a great democratic scheme of education.

Drafting-Room Management and Control

T. A. Hippaka, Supervisor of Industrial Education, Madison, Wis.

PART I

NUMEROUS visitations to classrooms where drawing is being taught have convinced the writer that much remains to be accomplished in the direction of more efficient management in the drafting room. It is quite evident that there exists a great waste of teacher and pupil time as well as energy that might be employed to better advantage. Unnecessary disorder in the class often arises from lack of organization and effective management. Mediocre and poor work prevails where good work would very naturally be the result under more effective control. Pupil participation, a very important factor, is often totally neglected. It seems that efficient organization and management would eliminate a large number of the common ills now prevalent in the drafting room. To be sure, the initial organization recommended here requires considerable time and energy, but once the system is established, the teacher cannot help but feel well repaid for the energy expended. Many minute and seemingly unimportant details have herein been stressed because they have been found of sufficient importance to be included. The purpose here is to present a type of organization and management whereby the usual difficulties may be reduced to a minimum, and where the management will actually be conducted by the pupils. While it is not recommended that the teacher make it a usual practise to leave his class, it is hoped that the type of organization advocated here will be a valuable aid during emergencies when the class must function alone. Where a teacher is ill, a class organized on this basis will not go to pieces even under the rather inadequate direction of a substitute teacher. Then too, much is being said about increasing the size of classes in drawing. Such increase in enrollment will mean even greater efficiency in control and management which the type of organization presented here will help meet. The recommendations made here are a result of many years of teaching, experimentation and observation. It is not even hoped that the average teacher will care to utilize everything advocated here. If a few practical ideas have been expressed which the teacher may employ in his work the time and energy devoted to the pages that follow will have been well spent.

Equipment for the Drafting Room

The first problem that confronts us is the matter of standards of equipment. Too often the mistaken notion that almost any kind of equipment is good enough for boys is the prevalent one. In contrast to this idea let us rather have the feeling that if equipment is such that the teacher cannot work with it, the boy surely cannot be expected to produce satisfactory results. On the other hand, it is not necessary to be extravagant in this respect. Where discretion is employed, substantial equipment can be purchased at a reasonable cost. Nothing is more harmful than to have taxpayers feel that extravagance prevails. Accommodations for a class of thirty pupils are recommended where a new building is to be constructed and where the enrollment warrants it. Especially with added effort on the part of the teacher toward better management and organization such a group can be effectively taught. Classes may not always number thirty but it seems advisable and very necessary that accommodations be provided for such a number. Equipment has been classified as general, individual, and special.

Let us first consider the matter of general equipment. Care has been taken not to have either an over equipped or an under equipped room for each has its faults. A room which has a floor area 37½ ft. wide and 40 ft. long with skylights and windows on two sides is recommended where a new department is being contemplated and where the enrollment warrants it. Figure 1 shows the layout of such a drafting room. It should be equipped with 15 double tables, with 12 lockers, (see Fig. 2), 30 stools, a large storage cabinet built into the wall, (see Fig. 3), 30 adjustable T squares with solid blades of hardwood 24 in. long, 30 ⅞ by 18 by 24-in. basswood drawing boards, 30 sets of instruments, an instrument case, such as is shown in Figure 4, an instructor's desk and chair, three built-in bulletin boards just as high as the blackboards, reference materials, a key panel, (see Fig. 5), a washstand, blue-print machine and washer, three blackboards, a pencil sharpener, and an economy box for blue-print paper. The double table with

twelve lockers is specified because it proves a saving in floor space and affords compact locker room thereby eliminating much unnecessary walking about the room on the part of the pupils. The matter of stools is optional. There are some who do not wish them in a drawing room and feel that a boy ought to be able to stand during a drawing period. To others they seem a matter of comfort.

A T square with an adjustable head and solid hardwood blade is recommended—adjustable so as to eliminate the loosening of the drawing; solid hardwood blade in order that it may be easily retouched when dented by use. The storage cupboard should be spacious enough in order that a year's supply of materials may be stored in it. Somewhere in this cabinet, space should be provided for reference materials in order that it be readily accessible. The instructor's desk and chair need no comment as the one generally used in the average classroom will answer the purpose. The three bulletin boards of various lengths, as indicated in Figure 1, should be installed in order that the work of the pupils as well as illustrations may be exhibited. A key panel with a hook for each boy's key is a most valuable aid. The pupil's name and session room appear under the hook for his key. Each key is to be on the panel at the end of the class period when the panel is securely locked in a cupboard until the next day.

The drawing room should have a washstand with hot and cold water. Drawings can be kept cleaner if the pupil has a place where he can wash his hands. Wherever possible, a blue-print machine should be provided. Manufacturers are making smaller machines well adapted for school use at a reasonable cost. It seems that a boy ought to be given an opportunity to carry his job of planning to completion, by being

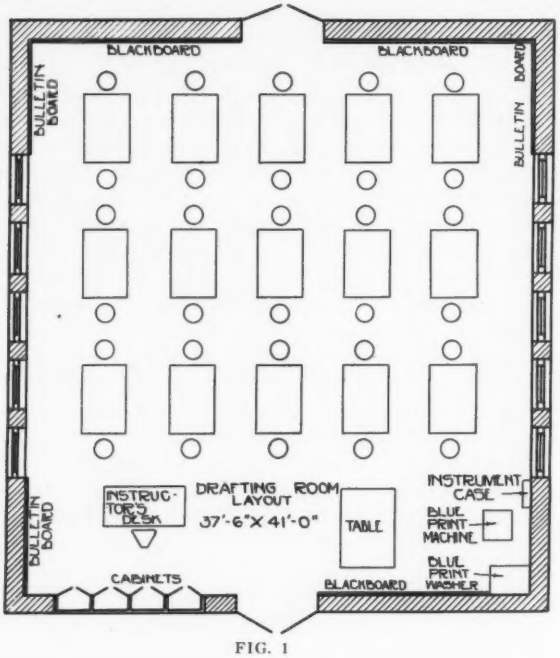


FIG. 1

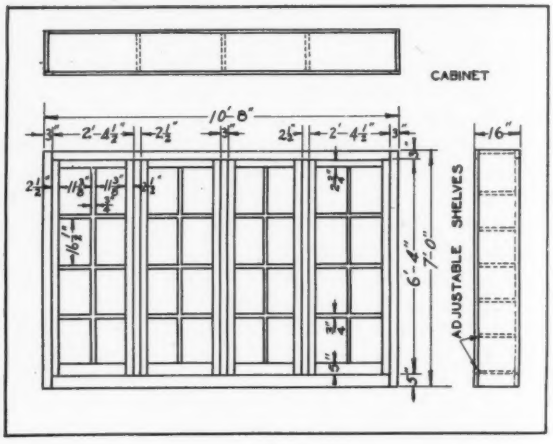


FIG. 3

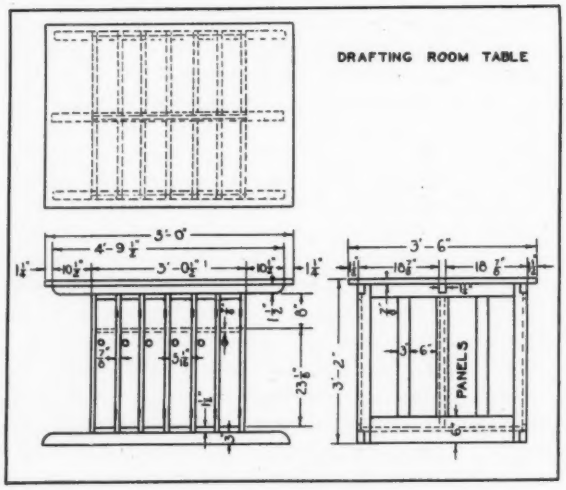


FIG. 2

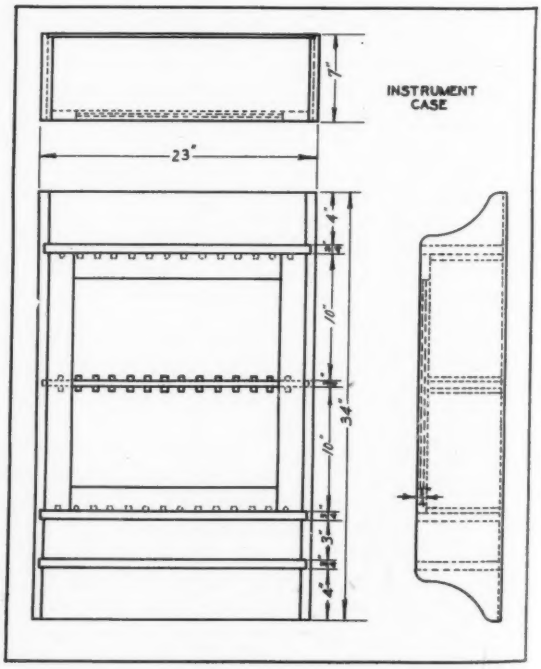


FIG. 4

permitted to make a blue print in a workmanlike manner.

Ample blackboard facilities should be provided, special attention being given to placing them in such a manner as to have the light strike them properly. Two pencil sharpeners made especially for drawing-room purposes should be supplied. It might be added that such a sharpener exposes the lead ¼ in. and

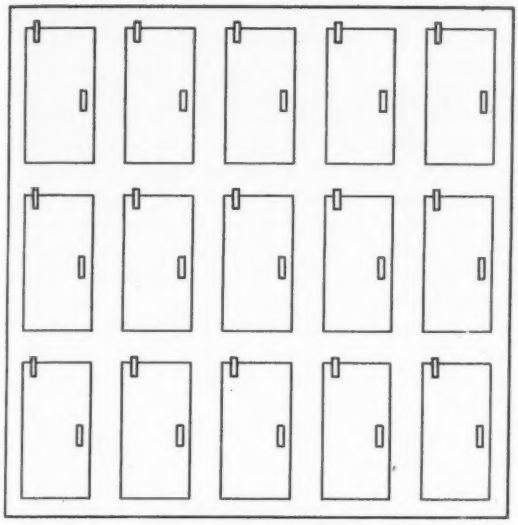


FIG. 5. KEY PANEL

may be brought to a sharper point on a small file or sandpaper. A 38-in. economy box for blue-print paper is placed on the list because it provides a safe place for such material and eliminates waste due to the simple measuring and cutting device attached to it. A large table is placed on the list to provide working area for the larger jobs.

Each boy should provide himself or be provided with certain individual equipment that he has for his personal use. The following constitutes a list of such materials: a box of thumb tacks, a small 6-in. flat file, a 6-in. 45-deg. triangle, a 6-in. 30-60 deg. triangle, a boxwood triangular scale, an eraser, a 2H and a 4H pencil, a blotter, pen wiper, common pen, a bottle of india ink and a good padlock and key. If the students buy their own equipment, it is best not to mention any particular dealer but to let them use their own discretion as to where they will purchase their materials. In fairness to local dealers, it is best if the supervisor sends each a list of the equipment which his students will need for their drawing work. Such a list enables the storekeepers to be of greater service to the boys, and it will incidentally create better feeling between the school and the various dealers. There is still another problem. Some boys will neglect to bring such equipment for a considerable length of time because "they forgot" or because they have insufficient funds with which to buy such working tools. To meet such situations it is well to have equipment on hand which can be sold to boys or rented to them at a reasonable price, otherwise they will soon lag in their work and become rather troublesome cases. However, it seems most advisable to give the students an opportunity to provide their own equipment and to resort to the methods just suggested only when necessary.

Boys who are not able to pay for their equipment, might be given a chance to work and earn it. Many school jobs come into the drawing room, and this or that boy might be permitted to work overtime in order to earn the money with which to pay for his tools. This may cause some inconvenience to the teacher, but certainly it is very much worth while in the few cases where it may be necessary. In dismissing the subject of individual equipment, special care should be taken to require each boy to be fully equipped from the very first day. He should have a locker where his materials can be placed under lock and key.

The boy should have access to a few of the special tools commonly used in a commercial drafting room such as the adjustable-curve ruler, universal drafting machine, draftsman's steel protractors, a slide rule, and section liner. If one of each could be purchased for the drafting room, such additions would prove very valuable.

The Selection of Equipment

The selection of equipment is a very vital matter. Upon its wise selection depends the confidence which school officials and board members can place in the teacher. If the room is properly equipped, the pupils will naturally enjoy greater opportunity to do better work. The task for the teacher may resolve itself into one of equipping an entire drafting room or merely selecting necessary replacements and additions to equipment already in use. Whatever the problem, it lists such items as will answer the needs of the department and specify certain makes or their equivalents. Such lists are then mailed to a large number of reliable dealers with a contract and a request that sample or sample types of construction be mailed to supervisor with each bid. Usually, both supervisor and the affected teachers examine the samples and the submitted prices. The composite judgments of the supervisor and teachers whenever possible should always decide as to what article has the greatest possibility for service with the least possible cost which may or may not be the lowest bid submitted. Actual selections are therefore made when the samples accompanying the bids are carefully scrutinized. Practical men in the field are always glad to give their opinions on certain brands and types of equipment. It is best that the supervisor should get as many opinions as possible on the samples submitted, especially where large amounts of money are involved. This method of procedure leads to a wiser expenditure of school funds and incidentally avoids much embarrassment.

The proper placement of equipment must be carefully considered. Sometimes the problem is one of placing equipment into a new school where carefully made plans are a guide. This is not a difficult task. But the problem also may be one of endeavoring to

place equipment into a room that was not originally designed as a drafting room, in which case the problem may be quite difficult. In working out the placement of equipment it is well to make a drawing of the room to a large enough scale so as to be of some consequence. Then strips of stiff paper may be cut out to the same scale to represent each piece of equipment and these are juggled around on the drawing until the placement is as satisfactory as it is possible to make it. Improper drawing-room habits, unnecessary eyestrain, undue commotion and restlessness are often a result of poorly placed equipment. Figure 1 shows a layout in which the equipment has been arranged so as to minimize such difficulties. The matter of eyestrain is automatically eliminated by sufficient windows and skylights. With ample light coming from the right direction many of the bad habits that may be formed in the drawing room also disappear. Cabinets, lockers, bulletin boards, washstand, and blackboards must be so distributed as to eliminate crowding to gain access to them. Too often we find the entire class attempting to get at the same cabinet at the same time. This accounts for much of the disorder that may be seen in some drafting rooms. In the layout shown in Figure 1, an attempt has been made to distribute the equipment as evenly as possible, and still have ample room so that people may move about the room with reasonable comfort to themselves and their fellow workers.

The proper care of equipment should be stressed. The efficient teacher will demonstrate carefully the correct use of each piece of equipment as well as its proper care. Boys as a rule see that better work can be done with tools that are well cared for, and that if instruments are to be kept in good condition it is up to them to do so. Neglecting to release spring instruments when placing them into the set, leaving ink to dry in a ruling pen or compass, scraping them with a knife to clean them, using the T square as a hammer, dropping the T square on the floor, using the scale as a straightedge, using a celluloid triangle as a device for prying out thumb tacks, and using a ruling pen as something to dig the drawing board with, are some of the common abuses that instruments undergo. These and many other shortcomings may be overcome if the subject is properly presented. The better teacher will develop a certain pride and sense of responsibility on the part of pupils in this matter. Pamphlets on the care of instruments may be secured free in large quantities from almost any instrument manufacturer. If the pupils own their instruments, they are usually quite anxious to learn how to take care of them. It seems only fair that pupils be made to pay for equipment that they break.

If the school furnishes the instruments, a fee of 25 cents per semester may be levied as rental for the use of instruments. The returns from such a source of revenue can then be used to purchase replacements for worn-out parts. However, such a fee is to be carefully distinguished from payments made for instruments broken by pupils.

Supplies for the Drafting Room

The selection of the supplies necessitates a technic similar to the one employed in selecting equipment. Teachers and supervisors should learn to anticipate their needs for an entire school year so that the purchasing can be done on such a basis. Much attention to small details is thereby eliminated which results in a considerable saving of energy and expenditure. The supervisor especially becomes a materials clerk where supplies are purchased in small quantities during the course of the year. Materials are to be listed by schools and such lists, together with a contract and request for samples, are mailed to reliable bidders. When the bids and samples come in they are examined by the supervisors and teachers, and recommendations are made as a result of their composite judgments. It is well to keep in mind that the materials selected should be good enough for the practical man to work on. If the materials are of an inferior quality the boy will soon become discouraged and will lose interest in the work. The pupil should be given the best possible chance for success in the work even in the matter of materials especially when it is possible to do so without excessive expenditure of money. Usually the students are required to pay for their materials, and they are therefore entitled to receive goods of a good grade. The average drafting room requires cross-section paper, cream-colored mechanical-drawing paper, tracing cloth, tracing paper, ink, blue-print paper, detail paper, isometric sketching paper, pencils, ink bottles with stoppers and quills, folders, and lettering cards. The cutting of stock should be eliminated wherever possible by specifying sizes best adapted to the work. Too often time which should be devoted to individual and class instruction is unwisely consumed in cutting and distributing paper during class time. Such a procedure is a great injustice to the pupils. If paper has been wisely purchased it is of the proper size when delivered, necessitating no cutting on the part of pupils or teacher. The efficient teacher will place into folders the amount of materials needed by each student for the course. He will do this during his vacant periods so as not to encroach upon regular class time. When the class arrives, it becomes a mere matter of distributing folders which can be done in a very short space of time, and the boy is then prepared to work for a considerable length of time without asking for further supplies. Too often the teacher is a mere materials clerk for a goodly part of the period just because he resorts to distributing paper a sheet at a time instead of settling the matter of supply distribution once and for all at the beginning of the course. The latter procedure eliminates much unnecessary commotion and moving about the room, and incidentally it gives the teacher more time to do actual teaching which is his real job.

(To Be Continued)

Industrial-Arts Curriculum Building

Harry B. Nash, Director of Research, and Roy R. Van Duzee, Supervisor Industrial Arts, West Allis Public Schools, West Allis, Wis.

CHANGING modes of living have given rise to a questioning attitude on the part of educators and laymen as to the effectiveness of the present means of education. This has in part given rise to a general movement in schools throughout the country looking toward the construction of a more reliable and worthwhile curricula.

The time has past when a list of plates to be drawn, an outline showing the tools to be used, or the problem involved in the use of these tools in the making of a group of projects, is an adequate course of study. Nor is a textbook sufficient guide to the teacher in preparing and presenting the content offered. Recognition of the inadequacy of the older guide in teaching has called for a careful study of the educational situation.

Some of the problems for which a solution is being sought are: What subjects should be included in the curriculum and what should be the basis of selections; in what grades should a subject be taught; should it be required or elective; what provision should be made for individual differences; what methods should be used in instruction; where should specialization begin; what are the objectives of courses and what should the students have learned at a given stage in the process of education? The solving of these problems and many others means a curriculum study with administrative and teaching adjustments.

This article presents a program of how one school, in a small-size city, attempted to meet the problem of curriculum revision.

In the fall of 1924 the superintendent of schools made an arrangement with the University of Wisconsin to cooperate with the West Allis teachers in a curriculum project. A committee plan, as outlined below, was suggested by Professor Barr and adopted.

The first-named writer of this article was requested by the superintendent to act as general chairman of the project and he, together with the superintendent, selected the various committees. Eighteen subject committees covering all subjects offered were named. Each teacher had been previously requested to express a preference for the subject in which he or she was most interested and this preference was given all the consideration possible in the selection of the personnel of the committees. Every teacher was a member of one committee. Supervisors, principals, department heads, and others best qualified to direct the work, were given charge of the groups. The subject committees were called vertical groups, while the X, Y, Z, and A, B, C, committees were designated horizontal committees. The plan of organization is shown herewith.

CURRICULUM CONSTRUCTION

Superintendent, T. J. Jones

General Chairman, H. B. Nash, Dir. School of Ed., U. Wis.

Curriculum Specialists, V. A. C. Henmon, A.S.; Professor Barr, Prof. of Ed., U. Wis.

Chairman Subject Groups	Department Head	Department Head	Department Head	Supervisor	Supervisor
Senior High School X Principal High School	Teacher	Teacher	Teacher	Teacher	Teacher
Junior High School Y Principal	Teacher				
Intermediate Grades Z Elem. School Principal	Teacher				
Primary Grades A Elem. School Principal	Teacher				
Kindergarten B Teacher	Teacher				
Kindergarten C Teacher	Teacher				

Committee Organization

The teachers welcomed the opportunity of working under the committee plan to carry out the project. A course of study building is valuable, if it succeeds in acquainting all teachers with school problems and subject aims, and if it broadens the teachers' conceptions of the work of all departments. One of the greatest benefits to the school is the added interest taken by teachers in carrying out the courses of study, when they have had an active part in molding them.

Preceding the work of the committees and continuing throughout the work, a series of lectures were presented by experts secured by the board of education. Professor Barr gave a series of ten lectures covering the general considerations in a course of study building. Some of the topics discussed were: Aims of education, new social conditions, types of school organizations, methods of selecting school subjects, the selection and organization of subject material, objectives and outcomes with regard to various levels of schooling, activities, methods and standards, provisions for individual differences, and testing results.

Lectures by Specialists

These lectures dealing with the broad aspects of curriculum study were followed by a second series of discussions by such men as Dr. Franklin Bobbitt, Dr. Thomas Gosling, and Dr. W. J. Osborn, Dr. Alfred L. Hallquest, Dr. A. H. Edgerton, and Dr. V. A. C. Henmon who each delivered a lecture on a special phase of the work, such as pupil interest, testing, guidance and special education. The West Allis Public Library, the board of education, and the teachers' associations placed at the disposal of the teachers a large amount of reference material including professional books, surveys, studies, tests, and courses of studies.

It would seem from the foregoing that the teachers were spending most of their time listening to lectures. However, work began at once and paralleled the lectures.

This work in industrial arts, as in other subjects, consisted first in the collecting of material which would aid in the project at hand. A careful study was made of research studies, of lists of industrial-arts objectives as prepared by Bobbitt and others, of recommendations by state departments, schools of education, and leading public schools in the country. As a result of these studies a set of general objectives was formulated by the committee for the industrial arts offered in our schools.

General Objectives

I. *Health*
   - A. To offer a program of education which will contribute to the safety and physical well-being of men and women in all classes of legitimate occupations.
   - B. To aid in the development of muscular coordination.

II. *Vocational*
   - A. To inculcate a general industrial intelligence and efficiency.
   - B. To provide a basis for vocational-guidance training.
   - C. To develop habits, attitudes, aptitudes, and practical skill, giving such technical knowledge as is pertinent to the activity.
   - D. To develop some degree of skill in manipulative trade processes and teach related and technical information as a basis for advanced rating in industry for those who elect to specialize in industrial-arts work.
   - E. To vitalize the fundamental subjects through their application and use in projects done by students in the shop.

III. *Social—Civic*
   - A. To prepare for unspecialized activities which are generally desirable regardless of the occupation into which one enters.
   - B. To develop an understanding of the industrial phases of our economic life and an appreciation for the men in all parts of the industrial world.
   - C. To contribute to civic efficiency by making the individual a more self-reliant citizen.
   - D. To aid the consumer in the intelligent choice of materials, design, construction, and workmanship.

IV. *Cultural*
   - A. To provide for instructive, operative, and observational activities upon the play level.
   - B. To provide for appreciation of the art or aesthetic side of industry and reveal the unlimited field wherein lies the source of much human enjoyment and appreciation of the beautiful.

The committee recognized that:

One of the main differences between the junior high school and the traditional elementary school is that the junior high school attempts to give the pupil a variety of experiences which will give the teacher and the pupil an idea of the pupil's interests, attitude, and abilities. The student is given instruction in art, music, academic subjects, home economics, commercial, and industrial courses. Wide opportunities are offered in the extracurricular activities for further contacts.

It is the function of the junior high school after having discovered definite abilities on the part of pupils to give opportunity to develop these abilities to the end that these abilities may be used for general development or for the pursuing of a hobby as a leisure-time activity, or as a foundation for further vocational preparation.

The senior high school aside from being a cultural agency is also a place of preparation for further study leading to the professions, to the business world, or to industry.

The courses offered in the industrial-arts department were planned with the above points in mind. It will be seen that the work falls in two distinct parts, that which is basic for all boys and therefore required, and that which if offered to permit opportunity to follow definite interests and to develop special abilities.

The required work in the 7th and 8th grades is based on the assumption that industrial-arts subjects are a definite and necessary part of the junior-high-school plan in the providing of exploratory experiences as a functional part of curricular offering, that information and skill are interrelating and interdependent, that occupational information for educational and vocational guidance is essential, and the development of handling abilities is a very important factor in the preparation for citizenship.

The elective work offered in the 9th grade is intended for further testing and crystallizing of

interests and abilities. It is a period of semispecialization. The work in this grade involves deeper study and the laying of a foundation for the work on a scale not attempted in the previous work. For this reason one-half-year units of work are not considered as being complete in themselves and only complete yearly units are credited toward graduation. This plan permits the development of abilities discovered in the 7th and 8th grade shopwork.

Senior-high-school work is vocational in character. It assumes that the pupil has a vocational interest in the work or is definitely interested in the work as a leisure-time activity, or for general informational content. For that reason definite sequences of work are suggested, based on training which is required for success in industry and which will include the elements necessary for the developing of abilities in the most well-rounded-out fashion. Fractional units beyond the 9th year are credited toward graduation. The industrial-arts course of study and the suggested sequences follow.

REQUIRED SUBJECTS

7B Woodwork and Drafting	5 periods per week
7A Home Mechanics	5 periods per week
8B General Metal	5 periods per week
8A Printing	5 periods per week

Elective Subjects—9th Year

Bench Woodwork	10 periods per week
Machine-Shop Practice	10 periods per week
Electricity and Auto Mechanics one-half year each	10 periods per week
Printing	10 periods per week
Mechanical Drawing	10 periods per week

Elective Subjects—10th Year

Machine Woodwork	10 periods per week
Machine-Shop Practice	10 periods per week
Machine Drawing	10 periods per week
Auto Mechanics	10 periods per week
Printing	10 periods per week
Patternmaking	10 periods per week

Elective Subjects—11th and 12th Years

Drawing—Machine 11th year	10 periods per week
Architectural 12th Year	10 periods per week
Linotype operation (not offered at present)	10 periods per week

Length of period, 50 minutes

Ungraded and adjustment group programs are diversified shop activities providing work for student according to their ability.

Major and minor sequences 9th and 12th years which may be selected for credit toward high-school graduation.

Woodwork

Major	*Minor*
9th grade Bench Woodwork	9th grade Benchwork
10th grade Machine Woodwork	10th grade Machine Woodwork
One year of Mechanical Drawing or Patternmaking	

Mechanical Drawing

9th grade Elements of Mechanical Drawing	9th grade Elements of Mechanical Drawing
10th grade Machine Drawing	10th grade Machine Drawing
11th grade Machine Drawing	or Architectural Drawing.
Architectural drawing may be elected to complete four years of drawing.	

Machine-Shop Practice

9th grade Machine-Shop Practice	9th grade Machine-Shop Practice
10th grade Machine-Shop Practice	10th grade Machine-Shop Practice
One year of Mechanical Drawing.	

Auto Mechanics

9B Electricity	9B Electricity
9A Auto Mechanics	9A Auto Mechanics
10th grade Auto Mechanics	10th grade Auto Mechanics
One year of Machine-Shop Practice.	

Printing

9th grade Printing	9th grade Printing
10th grade Printing	10th grade Printing
One year of Art	

The second-named writer of this article, who was chairman of the junior and senior high school industrial-arts committee placed the actual writing of specific courses of study in the hands of certain teachers. Responsibility for eight courses were thus placed with the understanding that the problems incident to the selection of material, its organization, the aims of the course were to be brought before the committee concerned for help and guidance; and that while the actual writing was to be done by an individual, each course was to be, in fact, a committee project. The work of the two committees was in turn subject to the approval of the entire industrial-arts committee before going to the directing committee. The grade objectives for the courses were thus prepared and approved.

The committee members then plunged into the matter of selecting the content to be included in the various courses. An analysis of each subject was made, based on the following:

1. What is done in industry?
2. What tools and machines does the worker use?
3. What does the worker need to know in order to do his work?
4. What is desirable for the worker, or the prospective worker, to know about the trade?

The analysis was made for two reasons: first, to determine what content should go into the courses of study and, second, to grade the content selected assuring a continuity of instruction in courses where the subject was offered two or more years. The chart form was used as it lends itself to additions and changes, and, further, relationships may be readily observed. Further study was made into methods to be used in teaching, determining of room and equipment needs, and the blocking out of the work to be taught into teaching units based either on the difficulty of the operation or the necessary sequence of operations.

The individual members were now ready to write the courses for preliminary tryout. Just what form should be used for this? It was felt that a uniform plan for the department should be used and that the form should provide for definite statements, i. e., what are the objectives of the work, the time to be spent in each phase of the work, how the work should be carried out, what materials would be needed to do the work, what was to be expected of the pupil at the end of each unit of work and a plan for determining whether the aims had been met. After some deliberation the following outline was decided upon, and was used thereafter for the writing of all courses.

PART I
Grade Objectives

I.
A.
1.
a)
(1)
(*a*)

II. As in No. I.
Note: Include objectives for shop sketching.

PART II
Time Allotment

I. Total time (periods and length in minutes).
A. Shop periods—number of periods and time.
B. Lecture—Demonstration—number of periods and time.
C. Class—Discussion—number of periods and time.
D. Sketching—number of periods and time.
Note: List the activities which lend themselves to the particular shop under consideration.

PART III

I. Statement of general method. (Use outline as in Part I.)
Note: The statement of general method should tell how the class is organized, what shop routine is employed, what instructional devices are used, how correlations are made. Use tests and the like. Mention all procedures here common to all units of work. Confine this statement to method.

PART IV
Units of Work

Unit I. Name.
Total time (periods and length in minutes).
Shop time (periods and length in minutes).
Lecture and demonstration (periods and length in minutes).
Class discussion (periods and length in minutes).

I. *Objectives*
Note: Specific as to operations, related information, guidance, sketching, outcomes.

II. *Methods*
Note: Relate here the special methods, procedures, and devices used to handle this unit not covered in the general statement of method. Consider help given in preparation, instruction sheets, blue prints, readings, discussions, notebooks, etc.
A. Lectures.
1. Name of lecture.
(Outline)
a)
(1)
(*a*)
B. Lecture and demonstrations.
1. (Outline)
a)
(1)
(*a*)
C. Class discussion.
1. (Outline)
a)
(1)
(*a*)
D. Shop.
1. Processes (list).
a)
b)
c)
2. Suggested Jobs.
a)
b)
c)

III. *Outcomes*
A. Statement as to skill and habits.
(Outline)
B. Statement as to knowledge which the student is expected to possess.
(Outline)
C. Statement as to attitudes or appreciations acquired.
(Outline)

IV. *Unit References*
Author. Title. Page reference.

PART V
Equipment

Statement here as to room size, lighting, connections for gas, water, electricity, and other requirements. Shop Plan.

Equipment List

Amount	Size	Name of Item	Trade Name	Number	Cost

Note: Consider satisfactory equipment to carry out plans. Specify in detail. Do not hold plans to present physical equipment and room space or administrative difficulties.

PART VI

I. Basic texts.
II. References—books and magazines.
III. Necessary supplemental material.
IV. Desirable additional supplemental material.

It was found that the task of writing up a definite and detailed course of study was not an easy one. The aim has been to unite the courses so carefully that a new teacher coming into the system would have a guide to his teaching which would make it possible to cover the course according to definite standards as set by the administration. A listing of principles to be covered and jobs to be done is not sufficient as the teacher must have guides as to relation of time spent in work related to shopwork, what the standards are, what methods he may use to get the most satisfactory results, and be familiar with the definite achievements the students are to possess upon completion of the course. When these experimental courses were duplicated, they were bound into pamphlet form with blank pages alternating with the typewritten pages. This blank page was provided as a convenient place to make notes when trying out the material in the classroom.

After a year of experimental tryout the courses were revised, checked over by the subcommittees and the directing committee, and the completed curriculum was ready to be put into its first semipermanent form. Considerable attention was given to this problem. It was finally decided that, since a course of study should be capable of constant change and adaptation to changing conditions, the form should be flexible enough to permit of such changes. For binding the units together, a loose-leaf pamphlet with cover was chosen in which the separate sheets are fastened together with paper fasteners and washers as shown in the following sketch. This form has proved very satisfactory. Several courses may be bound in one book if desired.

LOOSE-LEAF COVER AND METHOD OF FASTENING THE LOOSE LEAVES

A portion of a course of study is reproduced here to illustrate just how the courses were written up after the tryout. It will be noted that, with the exception of the listing of the equipment, the form given is identical with the form suggested.

A Unit in the Course of Study on Drilling

Unit IV.
I. *Objectives*
A. To develop the ability to do ordinary jobs of rough drilling.

B. To develop ability to drill holes to an accurately described circle.
C. To impart knowledge as to:
1. The construction and manufacture of drills.
2. The types of drill presses and their place in modern industry.
D. To develop ability to properly regulate feeds and speeds of a drill press as to size of drill and material to be drilled.

II. *Methods and Teaching Devices*
A. Lecture—Types of drills and their use.
1. The high-speed sensitive drill press.
2. The hand-feed drill press.
3. The radial-arm drill press—speeds and feeds.
4. Drilling in a lathe.
a) Between centers.
b) In chuck.
B. Lecture Demonstrations.
1. How to fit a drill correctly in sleeve and spindles and use of drill chuck.
a) Types of drill chucks.
2. Methods of clamping and holding work to table.
3. Method of adjusting for speed.
4. Starting hole and drawing drill over the center.
5. Use of drifts.
6. Use of proper cutting oil or lubricants for brass, aluminum, cast iron, machine steel, cold-rolled steel, carbon steel, etc.
7. Size of drills.
a) How to determine
b) Which drills to use for taper holes in relation to size of reamers.
8. How multiple drilling is done in industry.
C. Class Discussion and Study.
1. Drills, their form and uses.
2. Parts of a twist drill.
a) Point
(1) Dead center
(2) Lips
(3) Heel
(4) Lip clearance
(5) Lip angle
b) Body
(1) Margin
(2) Flute
(3) Web
(4) Body clearance
c) Shank
(1) Bit-stock shank
(2) Straight shank
(3) Tapered shank
(*a*) Morse
(*b*) Brown & Sharp
(4) Ratchet shank
3. Grinding twist drills
a) Lip clearance—how and why
(1) Proper lip angle
(*a*) For average work
(*b*) For special types of work
(2) Effects of faulty lip angle
(3) Use of twist drills
(*a*) Proper speeds and feeds
(*b*) Use of chucks as determined by the nature of the work and materials to be cut.
(*c*) Use of drifts and collets with tapered shank drills.
(*d*) Sizes of twist drills.
D. Shopwork.
1. Processes.
a) Plain and accurate drilling on flat and round work.
(1) Laying out and center punching
(2) Starting and drawing of drill to circle
(3) Drilling of duplicate parts
(4) Drilling of matched parts
b) Drill grinding
(1) Hand grinding
(2) Machine grinding
2. Suggested jobs.
a) Wrenches
b) Riveting hammers
c) Clamps
d) Foot scrapers
e) Machine parts
f) Vises
g) Screw drivers

III. *Outcomes*
A. Habits and Skills.
1. Ability to do rough drilling accurately on a drill press.
2. Habit of the proper care of drills, tapered sleeves, and collets and drill press.
3. Ability to grind a drill properly.
B. Knowledge.
1. Knowledge of drills, their various forms and parts.
2. Knowledge of the proper use of drills, their feeds, and speeds.
3. Names of prominent drill manufacturers.
C. Attitudes and Ideals.
1. Appreciation of the value of drills as an important tool in industry.
2. Appreciation of the value of good sharp tools in any shop.

IV. *Unit References*
A. Leonard—Chapters VII, VIII, IX.
B. Cleveland Twist Drill Co.—Handbook for Drillers.
C. Cleveland Twist Drill Co.—Handy Chart.
D. Starret—Handbook for Machinist Apprentices, pp. 47-64.
E. Burghardt—Machine Shop Work, Part I.

While the committee method of a course of study building is a slow and difficult undertaking which requires careful editing of the material, it is a valuable task to undertake in a school system. The advantages of a broadened viewpoint, an understanding of subject relationships, a knowledge of content, and a keen interest on the part of the teacher, result in improved instruction and repays many times for the effort put forth.

LACQUERED ENGLISH PIE CRUST TABLE, 1730
Photograph by The Metropolitan Museum of Art.

INDUSTRIAL-ARTS MAGAZINE

EDITORS

E. J. Lake *J. J. Metz* *S. J. Vaughn*

ART, ARCHITECTURE, AND INDUSTRIAL ARTS

Architecture has definite alliance with the trades and with the arts. The architect must know a great deal about the trades and must have a keen sense of artistic effects. In the first schools to develop architects in the United States, stress was laid on the building trades and shopwork pertaining to these trades was taught as a primary and basic part of the training of the architect. It is now recognized that architecture is a fine art and that the aesthetical effect of building is credited to architecture as a profession. With this distinction in mind it is not logical to use the term architecture in reference to school study that does not deal with the aesthetical interests of building.

The aesthetical training for architecture aims to develop a sense of suitable proportion, form, texture and color pertaining to building materials and their use in buildings. When the industrial arts in the common schools are devoted to cultural education rather than vocational training, it is well to apply the study of architecture in the common schools to study of proportion, form, texture, and color pertaining to building materials and their use in building.

Everyone has need of this understanding, and every city and urban community offers some examples of good and bad building that may be studied by school pupils.

Pictures of every style of building known to history may be secured for illustration at no great expense. Mounted clippings from the illustrated papers and magazines will make a collection that will serve a valuable purpose in impressing the architecture of the world on school pupils.

Illustrations of building materials and the effects that may be secured with them appear constantly in trade journals. In a word there is no more available or desirable application of art to education than through a study of architecture. Art teachers and industrial-art teachers should develop this application far beyond the present practice. This is one of the great opportunities for the development of the industrial arts.

The study of wood construction in frame building and the planning and construction of a garage or small house is not adequate to inform and instruct the schoolboy or schoolgirl in the important subject of building interest.

No human activity serves as a better school interest than building. Every race is distinctive in the type of their habitations and monuments. The history of the arts, and especially of architecture, is a graphical record of civilization from the primitive cave dwellers and nomadic tentmakers to the builders of modern skyscrapers.

Should a school subject, which is designed to interest and instruct young people in the industrial arts of the human race stop short with the making of a few working drawings for a garage or bungalow?

Before the champions of the industrial arts in the school curriculum may hope to establish their subject in the schools with suitable importance, they must discard the tradition of making a few interesting knick-knacks for immediate use and conceive the subject as a desirable and necessary subject of study for the education of all youth.

LOST SHOP TIME

Absence from shopwork, whether caused by personal illness on the part of the student or by other reasons, is a problem to some shop instructors. The question arises, "Shall the time be made up, and if so, how is this best recorded?"

The answer to the first part of the question involves a point of view. If we believe the shop should offer as many valuable experiences as the allotted time permits and the absence was unavoidable, therefore excusable, we would answer in the negative. If, however, we believe that a stereotyped course of study should be completed by each student and the stress is placed on time spent in the shop and material products produced, our answer will be in the affirmative. If we believe in individual differences we are aware that some students will get more experiences in an allotted time than others, and that some students could be absent several weeks and still have more experiences and material output than other students. In this case it is a matter of judgment in dealing with individual cases. It may be possible for the instructor to give more individual instruction to students needing it while the other members of the class are at work. Again, it might be necessary to keep some boys after regular school hours.

Directors, supervisors and shop instructors who still insist upon every student putting in so many shop hours and completing the same number of jobs in exactly the same way (the Prussian lock-step) have failed to see the light of modern pedogogy. Psychologists have taught for years that education in the last analysis is individual and that provision must be made for individual differences if we are to be considered as meeting our obligations. The stereotyped course of study, based upon hours spent in a shop surely does not meet these requirements.

The job and operation sheets developed to meet individual differences in our school shops have met with wide acceptance. Many of these are available through publication, and if a shop instructor cannot secure them for his particular activities, he must simply get to work and develop his own. They can then be used in his classes in mimeographed and blue-print form.

The answer to the last part of the question depends entirely upon the method used. If individual job sheets are used and a progress chart made for each class, or notations made each week in a roll book, no difficulties should be experienced at any time in determining just where each boy is in his shopwork. It matters little in this respect whether the job sheets are

prepared to fit a stereotyped course of study or are prepared to meet individual differences through offering variety and choice of projects for each shop experience.

It is not so important that students spend exactly so much time in school shops, but that they have rich experiences, culminating in the acquisition of the right ideals and attitudes toward work and life in general. Much more can be gained through the scientific organization of teaching materials and the proper presentation of that material in one month then can be gained in one year under adverse conditions.

No, it is not the hours spent in a shop which count the most in education, but what use was made of those hours.

BUSINESS AND EDUCATION

Under the foregoing title, The Week's Work, which is a weekly letter sent out to the members, officers, directors, and staff of the United States Chamber of Commerce, shows in a striking way, how the interest of business in education is assuming greater and greater proportions.

The editorial runs as follows:

Business interest in education is reflected in a wide range of chamber of commerce activities in this field summarized in a tentative report issued this week by the Civic Development Department of the National Chamber. The report, compiled by Edgar F. Fowler, in charge of the Department's education service, and based upon information received from 204 local chambers, is made in experimental form mainly to determine the value of this type of service to member organizations.

It reveals that chambers of commerce are taking an active part in the improvement of curricula and facilities of schools, the development of vocational and trade schools, stimulation of school attendance, Americanization and adult education, and many similar enterprises. It states, in conclusion:

The activities of chambers of commerce summarized in this report are concrete evidence of the interest of business men in the schools of their cities. This interest is shown in a variety of ways. It may be the endorsement merely of the program of the board of education or it may be the initiation and direction of a complete survey of the school system. Whatever the activity, here is ample proof that business men not only recognize in good schools a community asset, but through their chambers of commerce are cooperating with school authorities in an effort to make these schools more effective.

Significant of the fact that the futures of business and the schools are bound up together is the interplay of activity between the two. By these and many other contacts, business and education are being brought more closely together and are finding that their interests, though not identical, are similar. For the educator and the business man are bent on developing in individuals the ability to fill with more skill and vigor and with less waste of effort the demands of present-day life.

FORM AND FINISH

There are no art interests that concern the industrial-arts teacher more than form and finish.

Therefore, no precepts of design concern the industrial-arts teacher more than the precepts that relate to form and finish. Most shop products look well if they express the purpose in form and texture suitable to the material of which they are made. We sympathize with the old bricklayer who complained of laying brick as crooked as possible after spending forty years learning to lay them as straight and true as possible.

Those ingenious contraptions that combine a kit of tools in one tool may not express in their form each and every use for which the designer intended them, and they do express their hybrid function in degree. Hybrid tools no less than hybrid creatures are grotesque.

We conclude that the industrial-arts teacher need not to be a creative genius in either art or industry, but should have and should convey to his pupils a measure of common-sense judgement as to the proprieties of design in regard to form and finish.

At the present time there is evidence of extreme attempts on the part of the designers of commercial products to get up something new, unique, and startling. We have noticed in exhibitions of industrial arts that some of these extreme conceptions carry over into schoolwork. In fact this tendency of the teacher and the pupil to imitate the unusual projects of industry and art has had a detrimental rather than a beneficial result on the work of the school.

Jazz design is speculative in a commercial sense. These things are perpetrated with the thought of producing novelties that will catch the public fancy and sell as novelties. We have seen in school exhibitions of costume design, fashion-plate drawings so extreme in proportion that they could not possibly apply to other than freaks of nature.

When the weather and requirements of living are the same in the north, south, east, and west, there will be time to transport styles of shelter and furniture from one country to another. A Chinese pagoda in New York is as much out of place as a skyscraper in Hong Kong.

In a recent article on "The Tyranny of Texture" published in The Architects Journal of The American Institute, Francis P. Sullivan deplores and derides the extreme irregularity of form and surface which architects frequently give to their designs in the attempt to make them picturesque.

Mr. Sullivan expresses his delight in all honest, natural, and worthy textures; his love of the grainy fracture of split stone; the cleft surface of slate; the clean chisel cut in wood; the hammer mark, faintly visable on welded steel; the luster and hardness of glass, the gleam of lacquer; the polish of pewter, the admirable "leadiness" of lead.

The industrial-arts teacher will at least be safe and sane in aesthetical matters relative to school design if he develops in his pupils the conception of form as expressive of function and finish in the most interesting surface texture of the material employed.

A Tesla Coil Outfit

G. K. Pierce and H. D. Campbell, J. Sterling Morton High School, Cicero, Ill.

SOME time ago we decided to build an apparatus for high voltage, high frequency currents. This project not only proved valuable for demonstrating this interesting phase of electricity, but gave the students practical experience in constructing the transformer, gap, condenser, and Tesla coil.

The transformer required to charge the condenser was the most difficult part of the equipment to make, and will be described first.

No tools are required for this job that are not commonly found in any shop, with the exception of a tinners squaring shears. The squaring shears are necessary to do a good job of cutting the laminations for the core. If these laminations are cut with ordinary tin snips it will prove a tedious job and the laminations will not lie flat when finished. If squaring shears are not available, the work can be done at any tin shop at a very moderate expense.

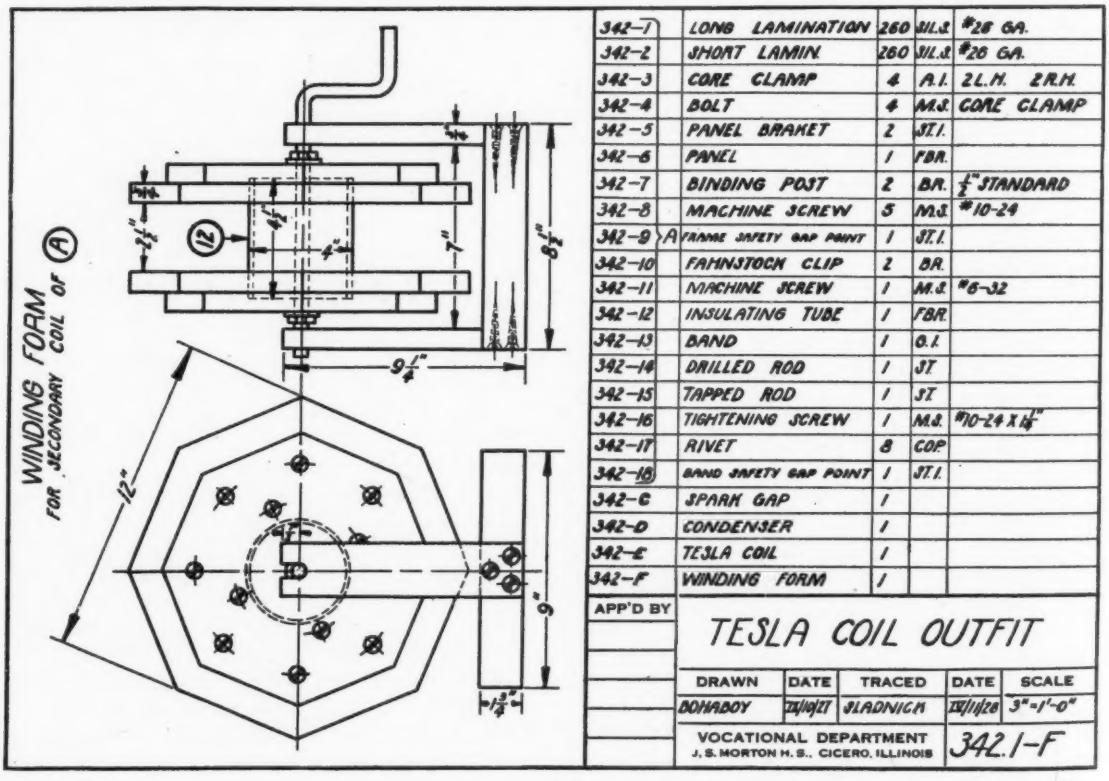
The coils should be wound first as it requires some time for them to dry out. This is especially true of the secondary. While the coils are baking in the oven the other parts of the transformer may be cut and drilled ready for assembling.

For winding the secondary coil a form should be made. A method of constructing this is suggested in Figure 1. The 4-in. fiber tube is let into the ends just far enough so that the faces of the boards will be 2½ in. apart all around. Its construction is clearly shown in the illustration.

Time will be saved if some strips of varnished cambric 2½ in. wide are cut and ready for use. A can of insulating varnish and a brush should also be at hand.

Now cut a strip of thin sheet copper about ¾ in. wide and 6 in. long. Slip one end of this between the fiber tube and the form so that it extends across the 2½-in. coil space. The other end will project outside the form and is used later for grounding the secondary winding.

One end of a spool of No. 30 enameled copper wire should be soldered to the end of the copper strip. Put about two wraps of the varnished cambric around the tube and copper strip and wind the first layer on top of this. The winding should be started ¼ in. from the edge and finished ¼ in. from the other edge. This makes the winding proper 2 in. wide and allows the varnished cambric to project ¼ in. beyond the winding. If the wire is wound across the full 2½ inches of space, some of the turns may slip out when the coil is removed from the form and come in contact with coils of another layer thus shorting out a section of the winding. The wire should be wound on evenly with the turns touching each other but they should not be allowed to pile up. This will be a little difficult at



342-1	LONG LAMINATION	260	SIL.S.	#28 GA.
342-2	SHORT LAMIN.	260	SIL.S.	#26 GA.
342-3	CORE CLAMP	4	A.I.	2 L.H. 2 R.H.
342-4	BOLT	4	M.S.	CORE CLAMP
342-5	PANEL BRAKET	2	ST.I.	
342-6	PANEL	1	FBR.	
342-7	BINDING POST	2	BR.	¼" STANDARD
342-8	MACHINE SCREW	5	M.S.	#10-24
342-9 (A)	FRAME SAFETY GAP POINT	1	ST.I.	
342-10	FAMNSTOCK CLIP	2	BR.	
342-11	MACHINE SCREW	1	M.S.	#6-32
342-12	INSULATING TUBE	1	FBR.	
342-13	BAND	1	O.I.	
342-14	DRILLED ROD	1	ST.	
342-15	TAPPED ROD	1	ST.	
342-16	TIGHTENING SCREW	1	M.S.	#10-24 X ¼"
342-17	RIVET	8	COP.	
342-18	BAND SAFETY GAP POINT	1	ST.I.	
342-C	SPARK GAP	1		
342-D	CONDENSER	1		
342-E	TESLA COIL	1		
342-F	WINDING FORM	1		

APP'D BY

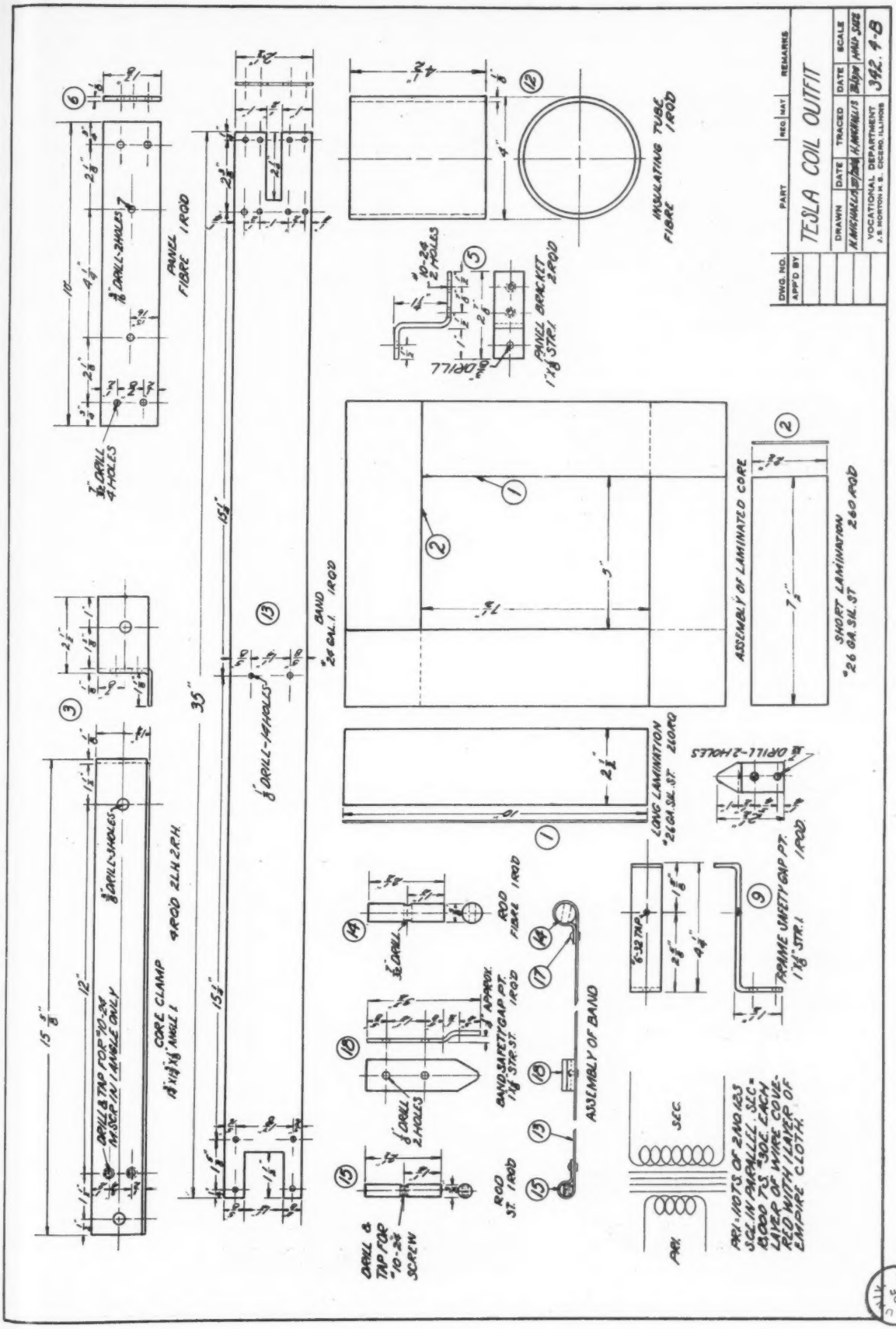
TESLA COIL OUTFIT

DRAWN	DATE	TRACED	DATE	SCALE
BOHABOY	12/19/27	SLADNICK	12/14/28	3"=1'-0"

VOCATIONAL DEPARTMENT
J. S. MORTON H. S., CICERO, ILLINOIS

342.1-F

FIG. 1


TESLA COIL OUTFIT
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MAT
REMARKS
DRAWN
DATE
TRACED
DATE
SCALE
VOCATIONAL DEPARTMENT
J. S. NORTON H. S. CICERO, ILLINOIS
342. 1-8
PANEL FIBRE 1 ROD
INSULATING TUBE FIBRE 1 ROD
PANEL BRACKET 1"x⅛" STR. 2 ROD
ASSEMBLY OF LAMINATED CORE
SHORT LAMINATION "26 GA. SIL. ST" 260 ROD
LONG LAMINATION "26 GA. SIL. ST" 210 ROD
BAND "24 GAL. I ROD
CORE CLAMP ⅛"x⅛" ANGLE I 4 ROD
FRAME SAFETY GAP PT. 1/8" STR. I
BAND SAFETY GAP PT. ⅛" STR. ST. I ROD
ASSEMBLY OF BAND
ROD FIBRE 1 ROD
ROD ST. 1 ROD
SEC
PRI.
PRI: 140TS OF 2 NO 16 S.C.E. IN PARALLEL. SEC. 8000 TS #30 E. CAVITY OF WIRE COVERED WITH 1/2 LAYER OF EMPIRE CLOTH.

FIG. 2

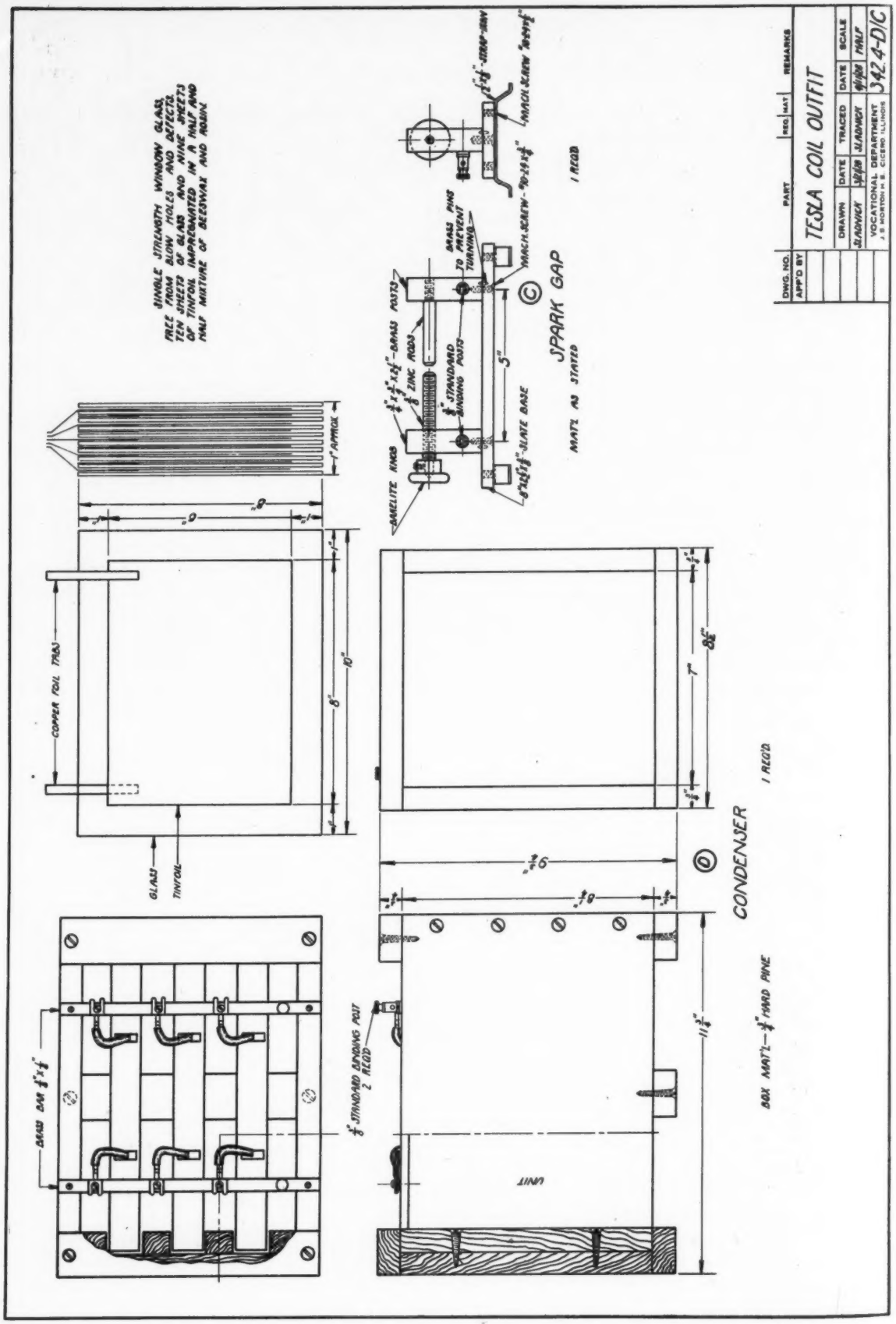

SINGLE STRENGTH WINDOW GLASS FREE FROM BLOW HOLES AND DEFECTS TEN SHEETS OF GLASS AND NINE SHEETS OF TINFOIL IMPREGNATED IN A HALF AND HALF MIXTURE OF BEESWAX AND ROSIN
SPARK GAP
MATE AS STATED
1 REQD
BRASS PINS TO PREVENT TURNING
MACH. SCREW
STANDARD BINDING POSTS
ZINC RODS
BAKELITE KNOBS
SLATE BASE
CONDENSER
1 REQD
COPPER FOIL TABS
GLASS
TINFOIL
BRASS BAR
STANDARD BINDING POST 2 REQD
UNIT
BOX MATL—½" HARD PINE
DWG. NO.
APP'D BY
PART
REQ.
MAT'L
REMARKS
TESLA COIL OUTFIT
DRAWN
DATE
TRACED
DATE
SCALE
J.RADWICK
J.RADWICK
VOCATIONAL DEPARTMENT
J. S. MORTON H. S. CICERO ILLINOIS
342.4-D/C

FIG. 3

first, but with a little practice the layers can be wound on very rapidly. It is best to assign two boys to do this work, one to turn the crank and one to guide the wire.

A thin coat of varnish should be brushed over the first layer and each succeeding layer as it is finished. A strip of varnished cambric long enough to go around the coil with ends slightly overlapping should be placed between each layer of wire.

About 170 to 180 turns of wire can be wound on each layer, if care is taken to keep the turns close together.

Approximately 18,000 turns of wire should be wound on the secondary in this way. The end of the winding should be soldered to a piece of flexible insulated wire (stranded fixture wire will do for this) for connecting to the terminal. Now wrap about three or four thicknesses of varnished cambric tightly around the outside of the coil and put on the clamping band. The coil may then be removed from the form and placed in the oven to bake.

The primary winding consists of 110 turns of two No. 12 gauge wires in parallel. The coil may be wound on a form 3 in. square and 4 in. long. Heavy flexible leads should be soldered at the beginning and end of the winding where the ends are brought out to the primary binding posts. The coil should then be removed from the form, dipped in insulating varnish, and baked. After the primary is baked thoroughly dry and hard, it should be taped with about two thicknesses of friction tape.

The silicon-steel laminations for the core should be cut to the size shown in the drawing. Also the angle irons for clamping the core may be cut, bent, and drilled as shown.

Stack up the short laminations log-cabin fashion until you have the required number. Each piece is 7½ in. long, but the stack when finished will be 10 in. long. There will be a 2½-in. space between the end of the stack and the end of every other lamination to allow the long laminations, which form the sides of the core, to dovetail in. This pile of laminations may now be clamped in a vise and two or three thicknesses of friction tape wrapped tightly around all but 2½ in. at each end.

Make another stack of the short laminations exactly like the first, and stand the two on end with their inside faces 7½ in. apart and fill in the long pieces. Be sure to have all pieces butt tightly together at the corners so as to keep the reluctance of the core to a minimum. Now clamp on a pair of angle irons and draw them up tight.

The partially assembled core may now be turned over with the open side up and the secondary coil slipped over the short leg which is to be at the top. Before placing the primary winding in place on the other leg, the core should be wrapped with micanite about ⅛ in. thick and 5 in. wide. Next, slip the primary over this and fill in the open side of the core with the remaining laminations.

The remaining parts to be assembled are plainly shown in the drawing. The safety spark gap should be set about ¾ in. apart. Its function is to protect the secondary winding. It may be necessary to change the dimensions of detail 9 in. (Fig. 2), depending on the size of the secondary coil. The secondary of our

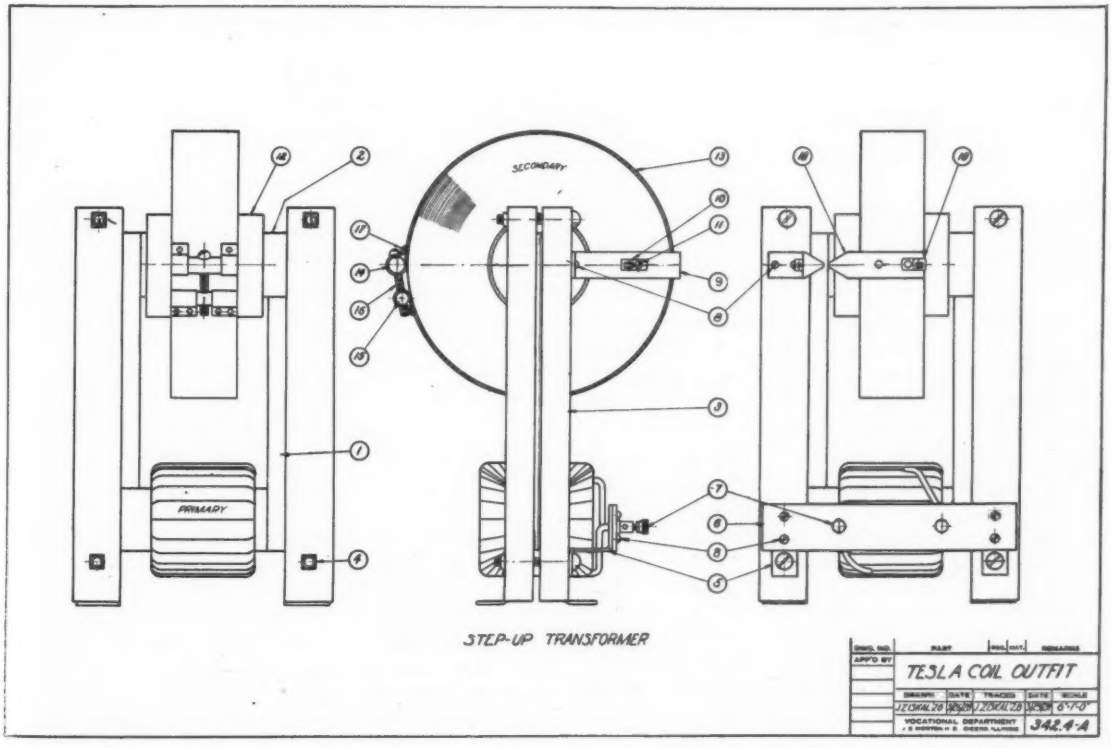
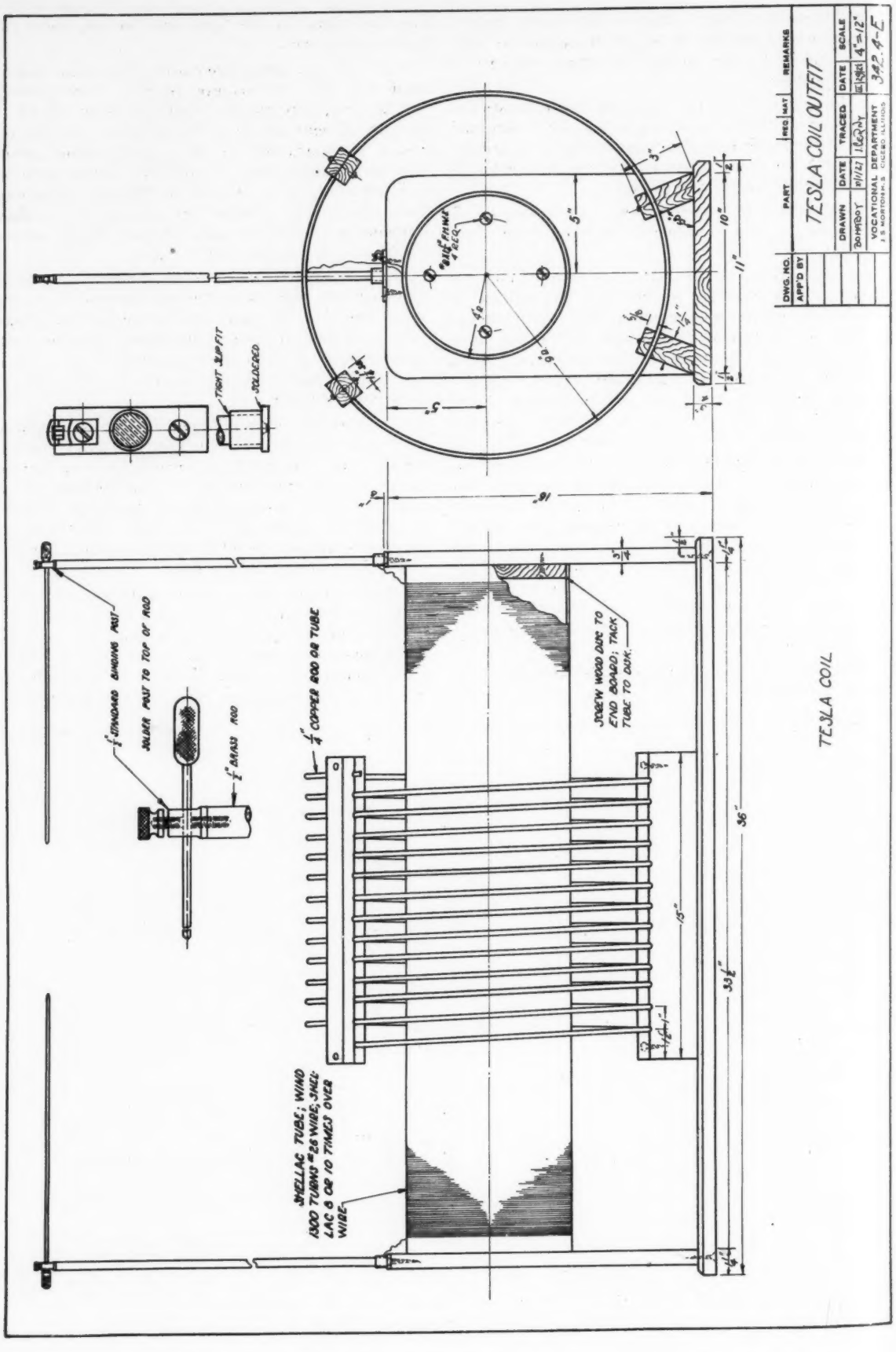


FIG. 4


TESLA COIL OUTFIT
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DATE
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REMARKS
TESLA COIL
SHELLAC TUBE; WIND 1000 TURNS #28 WIRE; SHELLAC & OIL 10 TIMES OVER WIRE
SCREW WOOD DUC TO END BOARD; TACK TUBE TO DUK.
¼" COPPER ROD OR TUBE
¼" BRASS ROD
SOLDER PUT TO TOP OF ROD
¼" STANDARD BINDING POST
TIGHT FIT
SOLDERED

FIG. 5

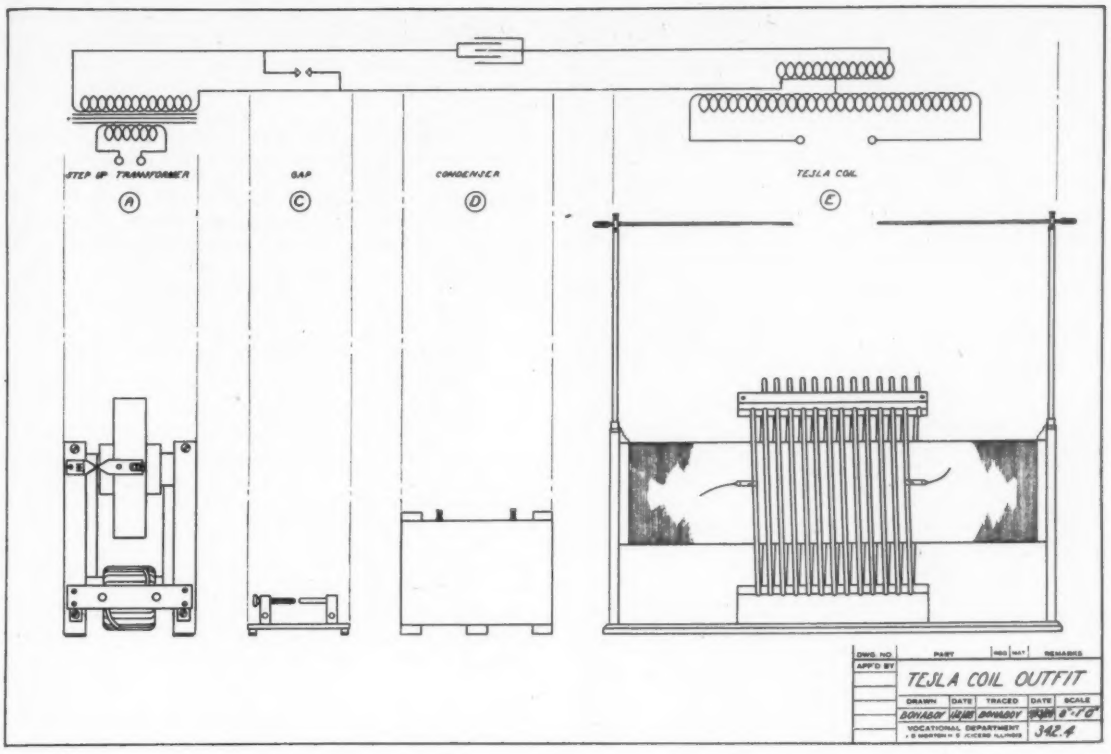


FIG. 6

transformer was 10 in. in diameter when finished. However, another coil made from the same specifications might be slightly larger or smaller, hence requiring a slight change in the length of this detail. The copper strip to which the beginning of the secondary was soldered should be clamped between detail No. 7 and the angle iron.

The ratio of turns on this transformer would give a secondary voltage of 18,000 with 110 volts on the primary. However, with this method of construction there is considerable magnetic leakage which cuts down the secondary voltage. We found on test that it would jump a ⅞-in. gap between points which corresponds to about 15,000 volts. In making this test, it was necessary to spread the safety gap to about 1 in. in order to prevent the spark from jumping at this point.

In case it is desired to run this transformer on 220 volts, the primary winding should have 220 turns of No. 12 instead of 110 turns of two No. 12 wires in parallel, or by putting on two windings of 110 turns each and bring four leads out, it may be used on either 110 or 220 volts as desired.

The condenser shown in Figure 3, is composed of three units mounted in a wood frame or box and connected in parallel by means of the two bus bars on top. Each unit consists of ten pieces of 8 by 10-in. window glass with 6 by 8-in. sheets of tin foil sandwiched in between. The bundle of plates may be bound together with a few wraps of wire and then dipped into a molten mixture of equal parts of beeswax and rosin. After the unit is thoroughly impregnated with this compound, it may be removed and allowed to dry. When dry, the binding wires may be removed as the plates will not come apart.

The construction of the Tesla coil is clearly shown in Figure 4. All wood used should be dry and varnished. The secondary may be wound with single cotton enameled or double cotton covered wire. The one described here was wound with the former and with adjacent turns touching each other. The middle point of the primary and secondary should be connected together and grounded when the coil is in operation.

The spark gap should be mounted on a base of good insulating material. Marble is preferable. If slate is used it should be of a variety which is free from metallic veins. If neither of these are available, then bakelite or dry hardwood may be used. The drawing of the spark gap is shown in Figure 5.

After connecting up as shown in Figure 6, and turning on the current, a discharge of blue streamers should be given off from the rods at the top of the Tesla coil. If the first trial does not produce results, try a different number of primary turns. In order to make connection to the primary turns easy, battery clips should be used on the end of the primary leads. After experimenting a little with the primary turns and spark gap, the coil may be brought into resonance. In this condition the secondary should give a spark about 20 in. long.

WHAT EDUCATION DOES

Education does three things: It creates wants and desires; it enables the possessor to render service, and the consumer to become a producer; it makes a higher wage possible.—*Hamilton.*

Bird-House Building

C. M. Gilmore, Hazard, Ky.

A VERY interesting and a very worth-while manual-training project for the early springtime is the bird house. The possibility of securing the material for the construction of the bird house from wooden boxes cast away by the grocery stores, reduces quite considerably the expense connected with the building of the project. As a matter of fact, by using wooden boxes the bird house may be built at such a small cost that it may be regarded as negligible. Then, too, the material from wooden boxes is soft and light and can be easily worked by the youngest boys in the manual-training department. The fact that the project permits a wide variety of individual touches, such as chimneys, porches, perches, etc., appeals to the older boys. After the prescribed dimensions required for the openings for the different birds have been observed, the boy is then more or less free to add any individual touch that may occur to him.

The bird-house project has a number of good arguments in its favor. The list may include:

1. The possibility of fostering in the heart of the boy a keener appreciation of birds. If a boy builds a bird house for some particular kind of birds, and witnesses how these birds rapturously take possession of the new home, he is almost certain to become much more appreciative of the birds. Not only this, but the boy is going to learn additional facts about the habits and characteristics of the birds by making a closer study of them as they busy themselves fitting up the house with their nests. He is going to claim them as his birds because they are living in the house that he has made.

2. The possibility of contributing to the boy's fund of general information. By directing the reading of the boy when the bird house is the project receiving attention in the manual-training department he will learn many things that he does not know about birds. He will learn of their economic value. He will learn about bird sanctuaries; he will learn something of the different kinds of birds and something of their habits and characteristics; he will learn of the different societies and organizations interested in and doing everything possible for preservation of birds and for spreading enlightening information about them.

3. The possibility of teaching the boys to be resourceful in the selection of material. So much material is ordered from the mill that the manual-training boy sometimes forms the notion that the mill is the only source of supply. Many projects besides the bird house may very well be constructed of wooden box material. The spools, from which mother has used the thread, may be used for the construction of appealing and interesting projects. If the manual-training department can teach the boy to be resourceful, it has certainly done something very worth while.

4. The possibility of permitting the boy to incorporate some of his own ideas in the project which he is building. The bird house gives the boy quite a range to add all of the individual touches that he may think of. When the boy gets out of school he is going to have individual ideas of his own and he is going to have to use them to get along. The earlier the boy is permitted to exercise his store of ideas the better it is for him.

5. The possibility of doing something worth while for the birds and for home surroundings as well as the surroundings about the school buildings. A good many birds take readily to houses made for them, and because of added protection which they afford, the birds are enabled to rear their young without so much risk. In appreciation for the home, the birds contribute their songs and enhance the surroundings by their plumage. If bird houses are established on the school premises they will make the surroundings brighter and happier.

6. The possibility of enriching and adding to the interest of the manual-training course. The manual-training department as a rule is interesting to the boy, and if interesting and appealing projects are made there he will be so much more interested. One thing which will make the manual-training course unattractive to the boy is to place in it projects that are beyond the capacity of the boy. The bird house is within the capacity of practically every manual-training boy and it is an interesting project.

Inviting Bird Bungalows

Esther E. Reeks, Boulder, Colo.

MUCH is being said these days about attracting the birds through the furnishing of suitable nesting sites, and children are being encouraged to build bird houses for the purpose. It is not uncommon for prizes, attractive enough to interest a large number of competitors, to be offered for the best of these houses. The danger, however, is that through a lack of understanding of the real requirements of the birds, many boys and girls spend their time on creations that are entirely unsuitable. Then when their offerings fail to meet recognition from either the judges or the prospective tenants, they become discouraged and quit in disgust.

In such a competition recently held, there were thirty entries, probably half of which stood no chance whatever of attracting bird occupants. Some of those over which most work had been spent and which showed the best workmenship and the most originality in design were among this number.

One of the most common defects was in the placing of the opening. In many, this was either too near the floor or else free entrance and exit was made impossible by the presence of a pillared porch that would prevent the spreading of the bird's wings as it launched forth. A few had the nesting cavity too small, while a number of others were painted in such a way as make them entirely too conspicious. It must be remembered that birds are usually anxious to conceal their nesting places.

The illustrations show two groups of entries. In the first are five that failed to win prizes in spite of their attractiveness to the human eye.

Look for a moment at the Dutch windmill in the center of the first illustration. As a piece of craftsmenship, this was perfect, but as a bird house it would be nothing but a failure. The first and most serious objection is the fact that the arms, which are attached so as to really turn in the wind, would frighten away

by their motion any prospective occupant. A second objection is found in the location of the doorway, which is placed on a level with the floor, whereas it should have been several inches up to allow the place being entered above the nest. While a third criticism could be made of the glossy blue and yellow paint with which the outside was finished.

Another real gem of workmanship and design from the human point of view is the bungalow No. 11. It would be hard to say too much for this as a work of art, but a fatal mistake was made in placing the entrance under the low pillared porch. If this had been in the gable end near the peak of the roof, the boy who lavished so much time and thought on his offering might have been rewarded with a worth-while prize, though the white paint is also objectionable.

The airplane at the top of the photograph is another illustration of miss-directed energy, as far as its possibilities as a bird house is concerned. Aside from the matter of its conspicuousness, the cavity is entirely too small for even a wren.

The pretty bark-covered offering at the right came very near winning first prize, but in the final analysis failed of even fourth. It was well made, attractive in outward appearance yet inconspicuous in a bird's natural surroundings; but it had two serious faults. One of these was the pillars beside the entrance, and the other was the shape of the bottom which allowed too little room below the opening for a comfortable nest.

The fifth of these houses had the common faults of light paint and wrong approach.

Another very attractive little house was made of a section of birch about 8 in. long and 5 in. in diameter. This was hollowed out, with an opening of the proper size and height for a wren, and had a spreading room of heavy cottonwood bark. It would have won a prize had it not been that four shingle nails used in securing two small twigs, which crossed in front for a perch, had been driven through so that nearly half their length protruded on the inside.

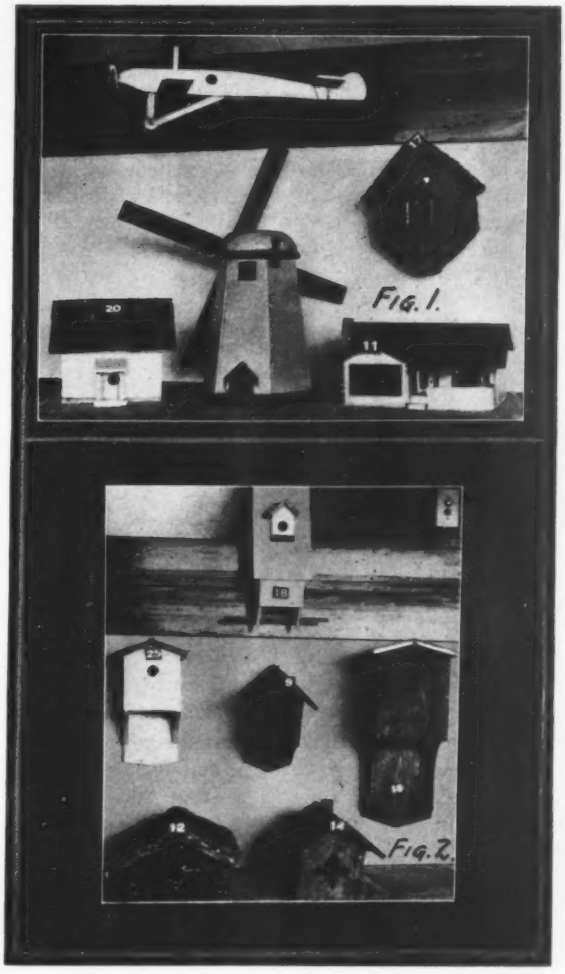


FIG. 1. BIRD HOUSES THAT DO NOT ATTRACT BIRDS
FIG. 2. BIRD HOUSES THAT ATTRACT BIRDS

SPECIES	INTERIOR DIMENSIONS In Inches		ENTRANCE DIMENSIONS In Inches		HEIGHT From Ground In Feet
	Floor Space	Height	Diameter	Distance Above Floor	
Bluebird	5 x 5	8	1 1/2	6	5-10
Chickadee	4 x 4	8-10	1 1/8	8	6-15
Flicker	7 x 7	16-18	2 1/2	16	6-15
Flycatcher (Crested)	6 x 6	8-10	2	8	8-20
Swallow (Tree)	5 x 5	6	1 1/2	1-6	10-15
Woodpecker	6 x 6	12-15	1 1/2	12	12-20
Wren	4 x 4	6-8	7/8	1-6	6-10

The second illustration shows the prize winners. These are conspicuous chiefly for their plainness and simplicity.

The small one in the center, No. 9, won first place. This shows by the size of the opening that it is intended for a wren, and all the dimensions are such as to be suited to that bird. It is finished with a coat of brown oil stain, making it blend well with outdoor surroundings, while the wide eaves, the lines at the bottom, and the perch formed by a forked twig give it attractiveness.

No. 19 won second prize. It is even plainer than the first. Yet its dimensions and the size and height of its entrance, together with the inconspicuous brown coloring make it a desirable house for a pair of bluebirds, for whom it was intended.

No. 12 won third place because of its neat workmanship, its pretty covering of bark, and the fact that its dimensions are well suited for either bluebirds or tree swallows.

The remaining three were given fourth prizes. They are well made and have good dimensions. No. 25 has an excellent feature that was not found in most of the others. This is a hinged bottom which can be let down by the loosening of a single screw, thus allowing it to be cleaned out easily. Its worst feature, as also that of No. 18, is its coat of shiny white paint.

The government, through the department of agriculture, some years ago issued a bulletin on the building of bird houses. Here is a table taken from it, giving the proper dimensions, size of entrance, height of entrance, and placing for each species commonly attracted in this way:

If a slight variation in some of these dimensions is made, birds may still be satisfied, yet it is best to stick pretty close to what has been discovered to be their general preference in such matters.

CHECKING TEACHING RESULTS

H. John Paustian, Walnut Junior High School, Grand Island, Nebr.

A CHECK list, such as the following, may be used by a supervisor, or may be used by the individual teacher in rating himself. No numerical scale accompanies it; the several points are not weighted. It is intended merely as an instrument for the improvement of teaching.

I. *Classroom Evidence*

1. Do the pupils interpret the teacher readily and correctly?
2. Do they go to work eagerly and cheerfully?
3. Do they require little or much help?
4. Is there evidence of improvement from week to week?
5. Are the pupils learning to study?
   a) Do they solve problems individually and independently?
   b) Do they stay on the job until the job is finished?
6. Is the class capable of continuing quietly and respectably when the teacher steps out of the door?
7. Is the class socially minded?
   a) Do they feel individually responsible for the welfare of the shop?
   b) Do they put away the tools and clean up the shop without suggestion?
   c) Are they quick to respond to suggestions for their own good?
8. Do their projects show evidence of craftsmanship evidently acquired in the shop?
   a) Are they worthy of the time spent upon them?
   b) Do they appear to be built according to good shop processes?

II. *Evidence Outside of the Shop*

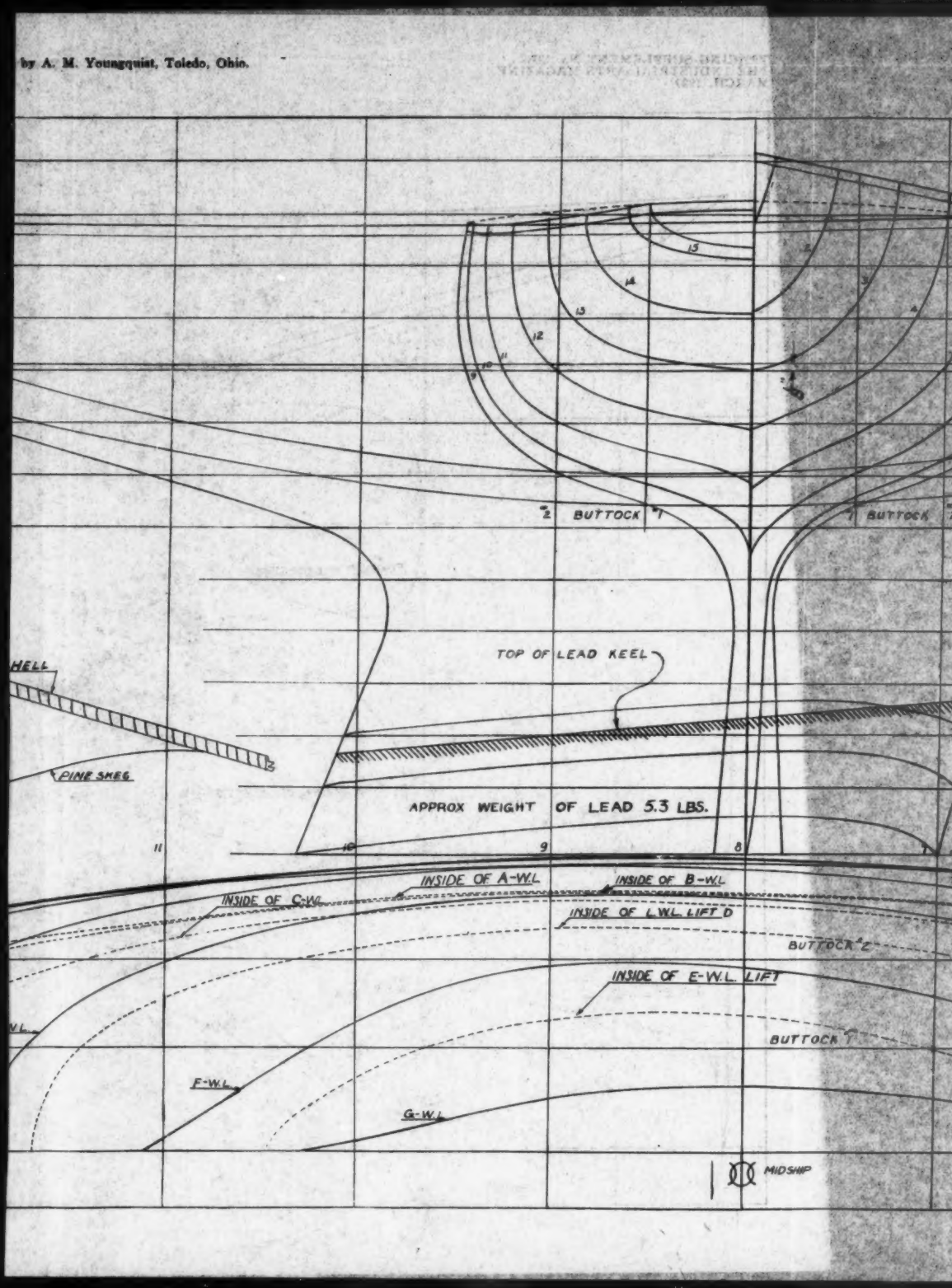
1. Do the pupils capitalize upon their shop experiences in other subjects?
2. Does shopwork give them an all-absorbing interest?
   a) Does it motivate good behavior?
   b) Does it help to keep them in school when they might otherwise drop out?

GREENHOUSE WHERE FLORICULTURE IS TAUGHT, WARREN G. HARDING HIGH SCHOOL, LOS ANGELES, CALIF.

TRACING SUPPLEMENT No. 127
THE INDUSTRIAL ARTS MAGAZINE
MARCH, 1929

Designed by A. M. Youngquist, Toledo, Ohio.

by A. M. Youngquist, Toledo, Ohio.



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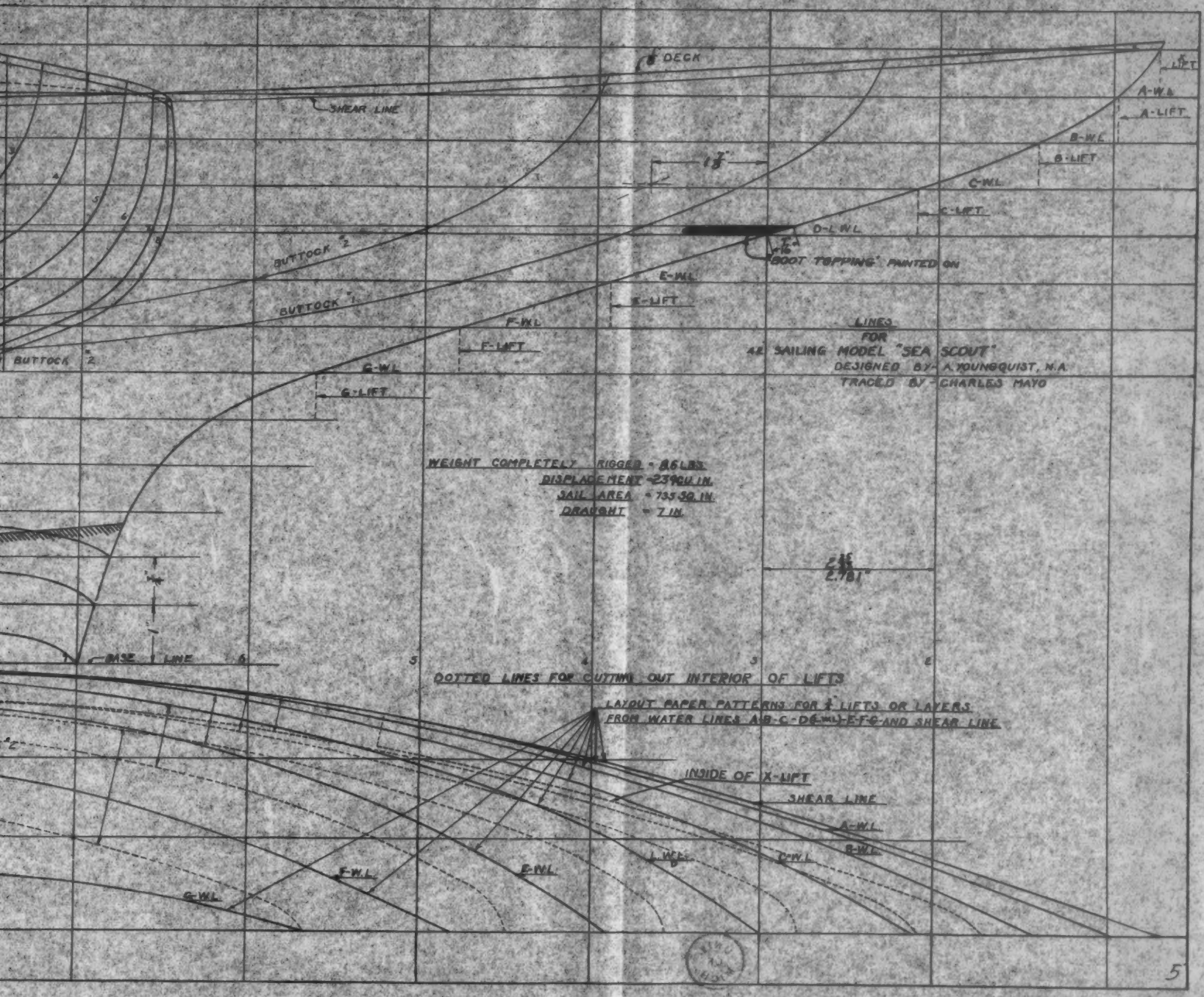

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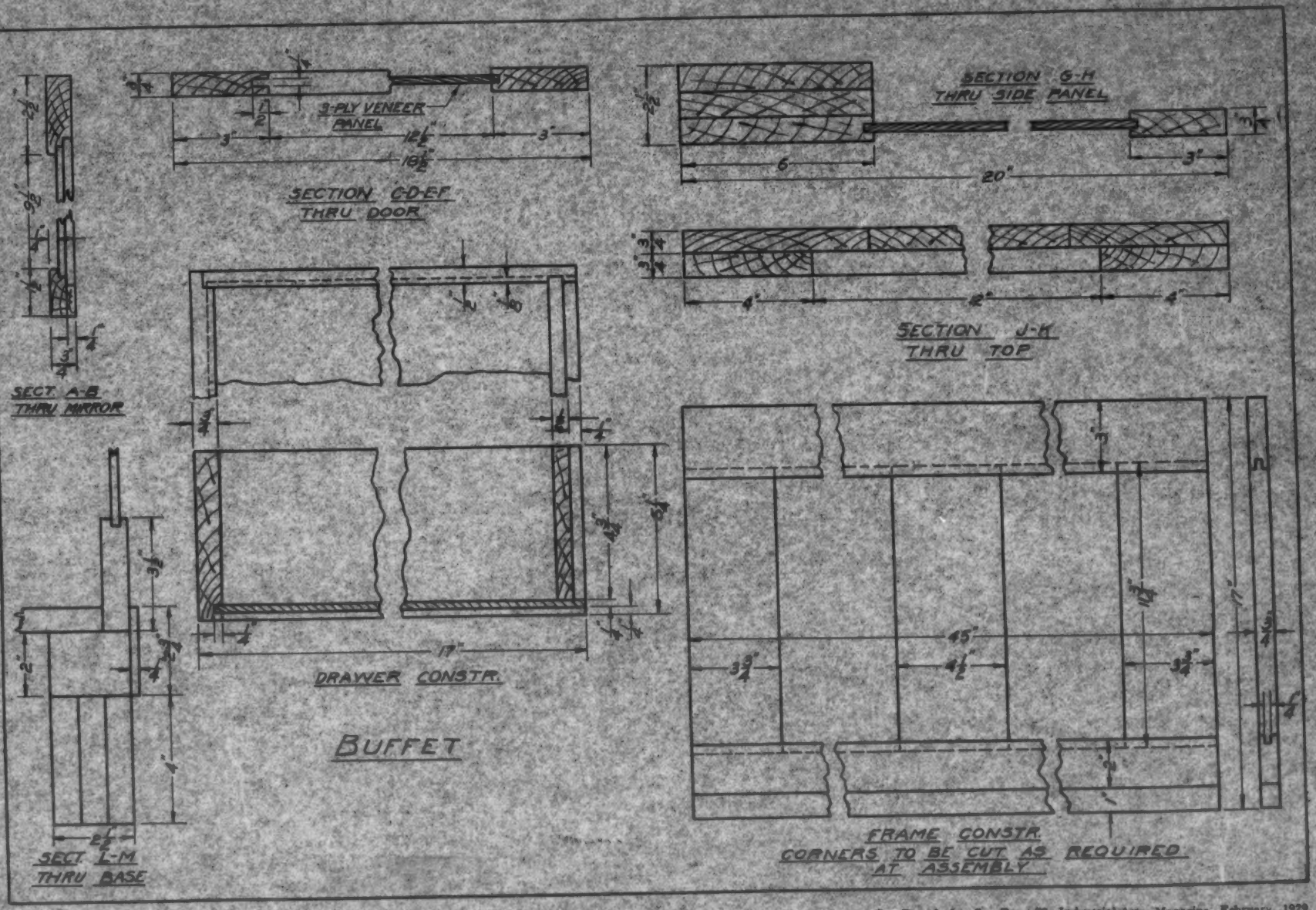

Designed by Wm. A. De Vette, Erie, Pa.

For Description See Page 72, Industrial-Arts Magazine, February, 1929.

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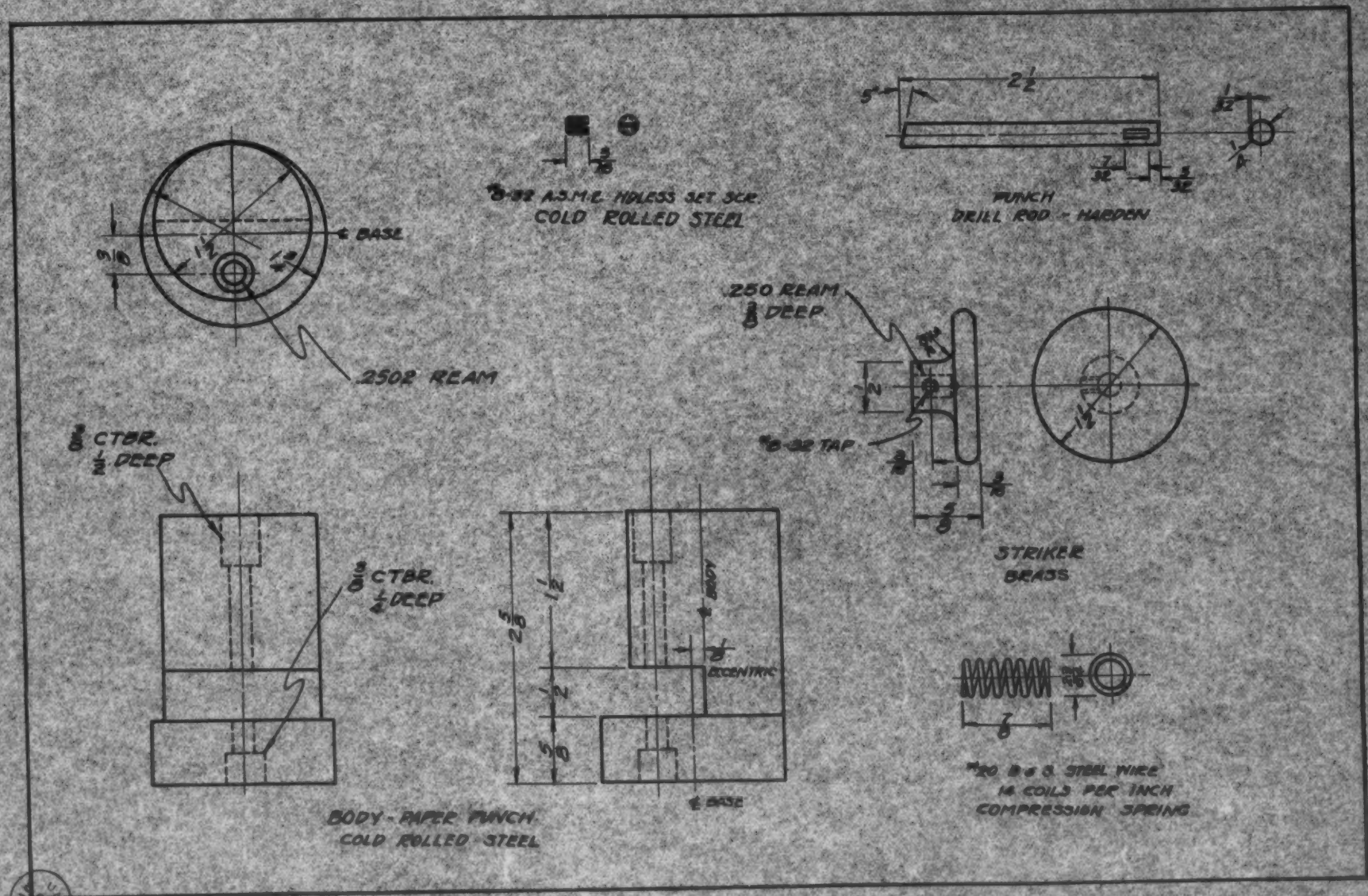


Designed by Rowland L. Hill, Jackson, Mich.

For Description See Page 139, Industrial-Arts Magazine, March, 1929.

PROBLEMS AND PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in woodworking, turning, patternmaking, machine-shop practice, sheet-metal work, forging, foundry work, auto mechanics, auto electricity, electricity, architectural and mechanical drafting, printing, bookbinding, concrete work, farm mechanics, home mechanics, and other lines of industrial-arts work are desired for consideration.

PAPER PUNCH

Rowland L. Hill, Jackson, Michigan

(See Supplement No. 129)

For an advanced machine-shop project this paper punch presents many interesting processes. In these days of loose-leaf notebooks, it is an article which proves useful both on the teacher's desk and at the home of the individual student.

The base offers eccentric turning, milling, drilling, reaming, and counterboring. Projects including eccentric turning are not very numerous in schools, so that it is worth trying on that account.

The striker affords some work in brass, a metal which is not generally used a great deal in school machine-shop practice.

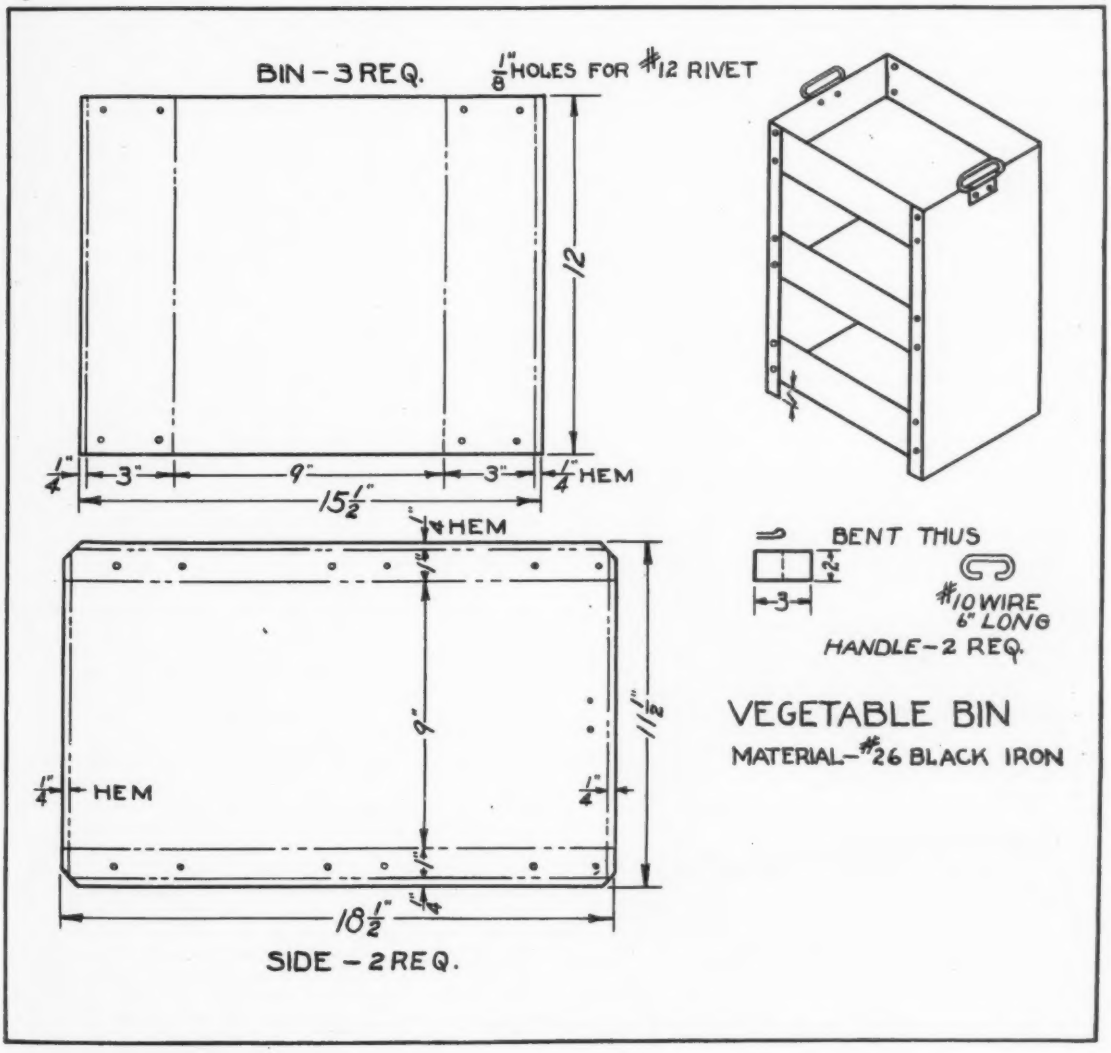
The spring is a very interesting job for any boy who is mechanically inclined. It may be made a problem for each student, or it may be made in one long piece from which pieces of the right length may be cut off as needed.

The punch must have a snug sliding fit in the body part. This requires good machine and assembly work. A little heat-treatment work is also required by this problem.

VEGETABLE BIN

Alfred Grayshon, Jay Cooke Junior High School, Philadelphia, Pa.

Every mother has a storage place for the vegetables, even though they may remain in the paper sacks, in which they came from the store. Her son, who is in the sheet-metal shop



once a week this term can make her a suitable receptacle in which to store the vegetables and fruit.

This vegetable bin is made of five major pieces of No. 26 gauge black sheet iron or galvanized sheet iron. It is a simple riveted job with single hemmed edges and has two handles for carrying.

Operations:

Side

1. Measure, square, and cut two sheets to the proper size.
2. Layout the binding lines and cut the corners.
3. Plot the positions of the rivet holes, and pierce.
4. Fold ¼ single hems on all the edges.
5. Make the right-angle bends.

Bin

1. Measure, square, and cut three sheets.
2. Layout the bending lines.
3. Plot the positions of the rivet holes, and pierce.
4. Fold ¼ single hems on the ends.
5. Make the right-angle bends.

Handle

1. Cut the sheet metal to size.
2. Cut the No. 10 wire to length.
3. Shape the wire.
4. Bend the sheet-metal strip in the center over the shaped wire to form the handle.
5. Pierce the rivet holes to suit.

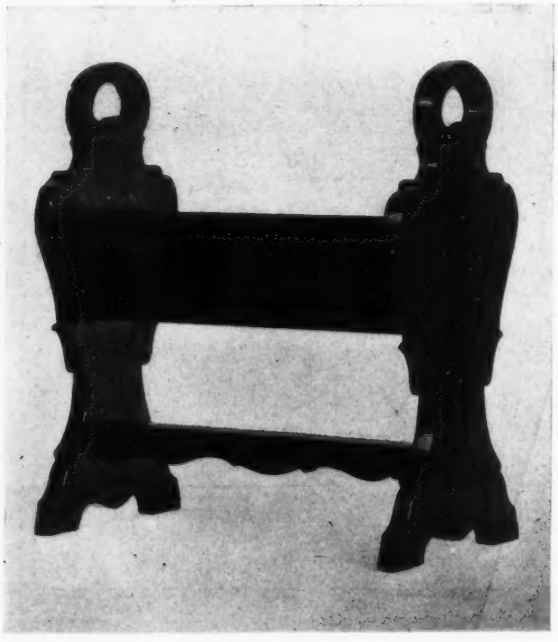
Assembly

1. Rivet the handles on the sides.
2. Rivet the bins in place using 12-oz. rivets.
3. Enamel or paint with color to match the kitchen or pantry.

BOOK TROUGH

Richard Shaver, Fredonia High School, Fredonia N. Y.

The book trough shown herewith, offers a remarkably finished appearing piece of furniture with a minimum number of pieces of stock and a simple assembly. Many variations, such as differently shaped overlays, composition ornaments, and transfers, are easily adaptable to the shape of the ends, or the book trough may be made without ornament and still look well. The overlay on the handles, as illustrated, serves two purposes, that of decoration and also, when the grain of the veneer runs at right angles to that of the end, it strengthens a naturally weak place in the handle. If veneer is not obtainable, a piece of ornamental wood, ⅛ in. or less in thickness, will answer very well and still be less expensive than an ornament or transfer. The overlay used on the trough shown in the illustration, was sumac. This wood looks well, as it is a light yellow wood with a distinct figure, but burl walnut, sap walnut, or satinwood, may also be used.



Construction

Ends. The ends are generally built first. If stock less than 11 in. wide is to be used, glue up two pieces which will give the desired width, and then square up the piece to 23 by 11 in. If dowels are used, see that they are so located that they will not be cut when the shape is cut. Then draw in the center lines and lay out the shape from a template on either side of the center line. Before sawing to shape, make a cut with the variety saw on the center line, into the opening of the handle, so that the band saw may work into the handle. After the handle is cut out, glue a thin piece of wood, just the thickness of the saw (usually ⅛ in.) into the saw kerf. This patch is later covered by the veneer and this method of removing the wood is much easier and faster than boring out the stock, besides insuring smoother inside edges.

If a ¼-in. blade is used on the band saw, all the curves may be easily followed. In sanding these edges, a spindle sander, or a homemade spindle between the lathe centers, will save a lot of hand sanding. It is often easier to sand both pieces together, while holding them with a clamp, and then too, they are sure to match.

Overlays. In cutting out the overlay, the veneer is placed between two pieces of scrap wood, at least ¼ in. thick, and of the same size as the veneer. The shape of the overlay is drawn on the top piece of scrap, and the three pieces are fastened together with brads or screws, so that when the shape is sawed out, the edges of the veneer will not chip. The brads must be so located that they will pierce through the scrap parts of the veneer and not crack the parts to be used for the overlay. Do not attempt to cut out the opening in the overlay for the handle, until after it is securely glued to the end, when it is done with the point of a sharp knife. It may be well to cut the overlay a trifle large so that after it is glued on, the edges may be sanded down to conform with the shape of the piece to which it is glued. The pieces of scrap which were sawed out with the veneer are just right for glue blocks to be used in clamping the veneer in place. Be careful in removing the extra glue, not to chip the overlay. Sand the entire ends and remove all glue.

Trough. In order that the sides of the trough be the same size after assembling, one piece must be narrower than the other, by the thickness of stock used, in this case ¾ in. Cut out the two pieces, one 7 in. wide and the other 6¼ in. wide, both being 18½ in. long and ¾ in. thick. The top edge of the trough is made with two cuts on the variety saw. The first set has the saw ¼ in. up and the ripping fence ⅛ in. away. Run the pieces over with the outside face down and the top edge against the fence. Then with the fence ¼ in. to the left of the saw, the saw ⅜ in. up and the table tilted 45 deg., complete the cut with the edge down and the inside surface against the fence. Before making the last cut on the saw, the set should be tested on some scrap of the same thickness, and any adjustments needed made before cutting the trough.

Stretcher. Square up the stock for the stretcher 18½ by 2 by 1 in. Lay out the shape of the bottom edge from a template. Band saw out, and sand on the spindle. Locate and bore the two holes for the ⅜-in. dowels which attach the stretcher to the ends. Sandpaper all over with 00 sandpaper.

Assembly

The trough is first assembled and glued up. The two parts are held together with three ⅜-in. dowels about 1 in. long. Much care must be taken in laying out the holes so that they will line up and that when the trough is glued up, the sides will make a 90-deg. angle with each other. After the trough is glued up, locate and bore holes for three dowels in each end to attach the trough to the ends. Locate and bore the holes in the ends that match those in the trough and stretcher, and clamp up to see that they fit as they should and that when assembled, all the feet are touching the floor. Any defect here can probably be remedied by a readjustment of the clamps to pull the short leg down and square the job up. When it tests true, take apart and glue. Clamp up as before, test and set away for the glue to set.

Bill of Material

Overall Finished Sizes				
2 pc. 23	x 11	x 1		Ends
1 pc. 18½	x 7	x ¾		Trough
1 pc. 18½	x 6¼	x ¾		
1 pc. 18½	x 2	x 1		Stretcher
2 pc. 1½	x ⅝	x ½		False Tenons
2 pc. 7 by 7-in. veneer				Overlay

Finishing

The difficult part of the finishing job is bringing out the difference between the overlay and the rest of the wood. Finish the overlays in light-colored natural, and stain the rest of the job in brown mahogany or walnut. This necessitates first coating the overlay with shellac, so that when the staining is done, none of it penetrates or colors the overlay. Then the coat of filler is applied to the wood with the exception of the overlay, and from there on, with the shellac and varnish, the overlay is treated the same as the rest of the job. The shellac coat and the first coat of varnish should be rubbed down with fine sandpaper, and the last varnish coat, rubbed with pumice stone and oil.

MATCH BOX

Edward Stein, Adjustment School No. 50, Buffalo, N. Y.

The match box is a fine project to use in the beginning of a sheet-metal course. It covers several operations and processes that are essential in the making of larger sheet-metal projects later in the course.

Some of the operations and processes covered are elementary mechanical drawing, use of circle and straight snips, solid punch and prickpunch, use of bar folder and brake, fastening metal together by means of the prickpunch, developing a side, fitting pieces together, and other minor operations.

This project will test the boy's sense of accuracy and thoroughness. It is not a difficult project, but it will keep the boy's interest on what he is doing. It is a project that every boy wants to take home. Enough simple mathematics is involved to make the layout one of computation.

I give this project as a mechanical-drawing lesson first. The younger groups draw the pattern of the back only, the older boys make the complete drawing of the pattern of back and pattern of pocket. The layout on metal is made from the drawing; this has great value.

IX coke or charcoal tin, black iron, galvanized iron and copper may be used for this project. The pattern of the back is laid out first and then cut out. A 3/16-in. hole is punched for hanging the pocket. The ¼-in. laps are folded over but not flattened, as the pocket fits in these folds. The ⅛-in. folds at the bottom are folded over and flattened down enough to allow a piece of sandpaper to be fitted in.

The pocket is laid out as shown in the drawing. The width of the top and bottom being taken from the measurements given on the pattern of the back. In developing the side as shown in the illustration, open the dividers from A to B, keep one point on A and swing an arc to *x*, reverse the dividers keeping one point on B and swinging an arc to *x*. Make a dot where the two arcs meet. From this dot draw a straight line to A and a straight line to B. Develop the other side in the same manner. Add the ⅛-in. hems and the ¼-in. laps.

After the pocket is cut and notched, fold over and flatten the ⅛-in. hems on the top, place the pocket in the brake and bend up the sides. With pliers bend the ¼-in. laps out square with the sides, fold over the ⅛-in. hem on the bottom with pliers on the same angle as the sides so the pocket will lay flat. Fit the pocket to the back, flatten down the ¼-in. lap and secure with prickpunch marks through the three thicknesses of metals.

Remove all sharp corners with the file. The project can then be attractively finished with enamel, gesso, or polychrome treatment.

A SUGGESTION ON GLUING

L. D. Keaton, East Texas State Teachers College, Commerce, Texas

To those who teach beginning classes in woodwork, and who have trouble in removing the surplus glue from mortise-and-tenon joints, I would suggest the following on projects in which oil is to be used as a part of the finish.

1. Place mortise-and-tenon joints in proper place.
2. Moisten a piece of soft cloth with linseed oil.
3. Moisten the wood with the oil about the joints where a surplus of glue is likely to occur.
4. Apply the glue to the joints and clamp up.

Caution: Do not allow the oil to get in to the mortise or on any part of the tenon.

Results: All surplus glue may be removed easily with a chisel without the slightest scar or scratch, leaving a clean joint without the slightest trace of glue.

FOOTSTOOLS WITH POINTED ARROW AND BLUNT ARROW FEET

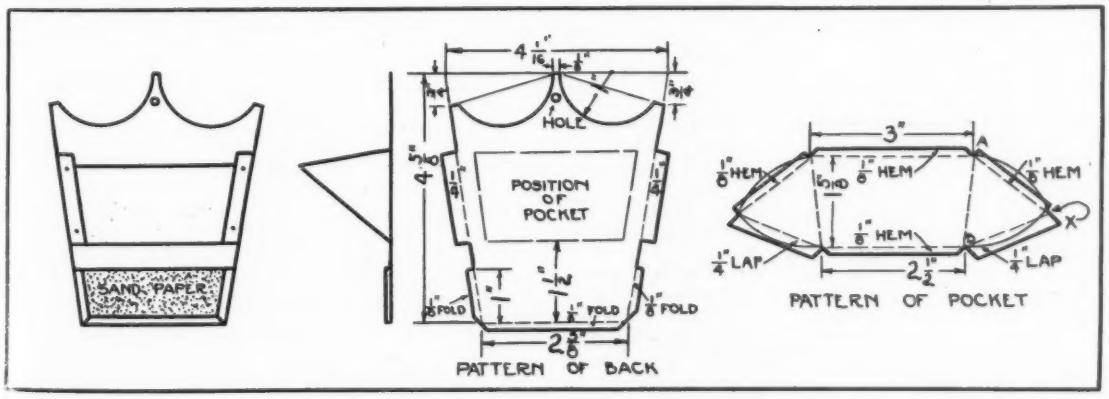
Franklin H. Gottshall, Director of Industrial Arts, Mount Berry College, Mount Berry, Ga.

The two footstools here shown are very graceful, and if a collector of old American antiques could find an original similar to either one of them, he would pay a good price for it.

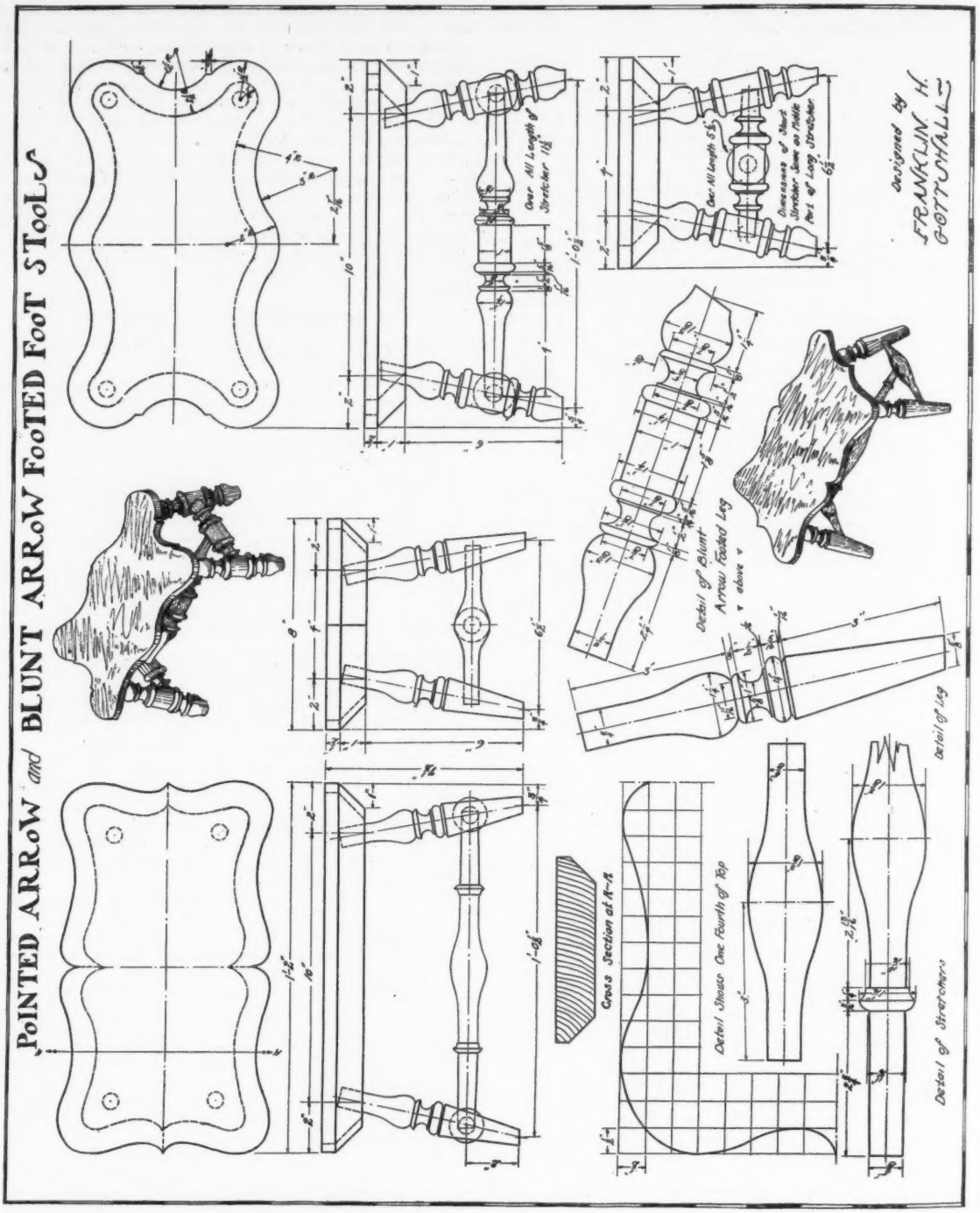
The fact is that the pointed arrow foot is very nearly like those on footstools commonly found in New England, while the blunt arrow foot seems to have been originated by the old Pennsylvania cabinetmakers.

The tops of these footstools should be made of soft pine, 1½ in. thick. The legs and stretchers can be made of either ash, hickory, or maple. If so desired the stretchers can be dispensed with entirely. However, they will add so much to the appearance of the footstool, or "cricket," as they were sometimes called, that the writer advises putting them on.

In order to bore all the holes at the correct angle, a jig should be made by cutting a block 1½ by 8 by 14 in., into which two slanting ¾-in. holes should be bored, one on each side on one end of the jig. When this is clamped to



MATCH BOX, DESIGNED BY EDWARD STEIN, BUFFALO, N. Y.



the under side of the top it will serve as a guide so the holes can be bored at exactly the right place and the correct angle. This is about the only way of making sure that the holes are bored at the correct angle. The holes should be bored before the top is cut to shape.

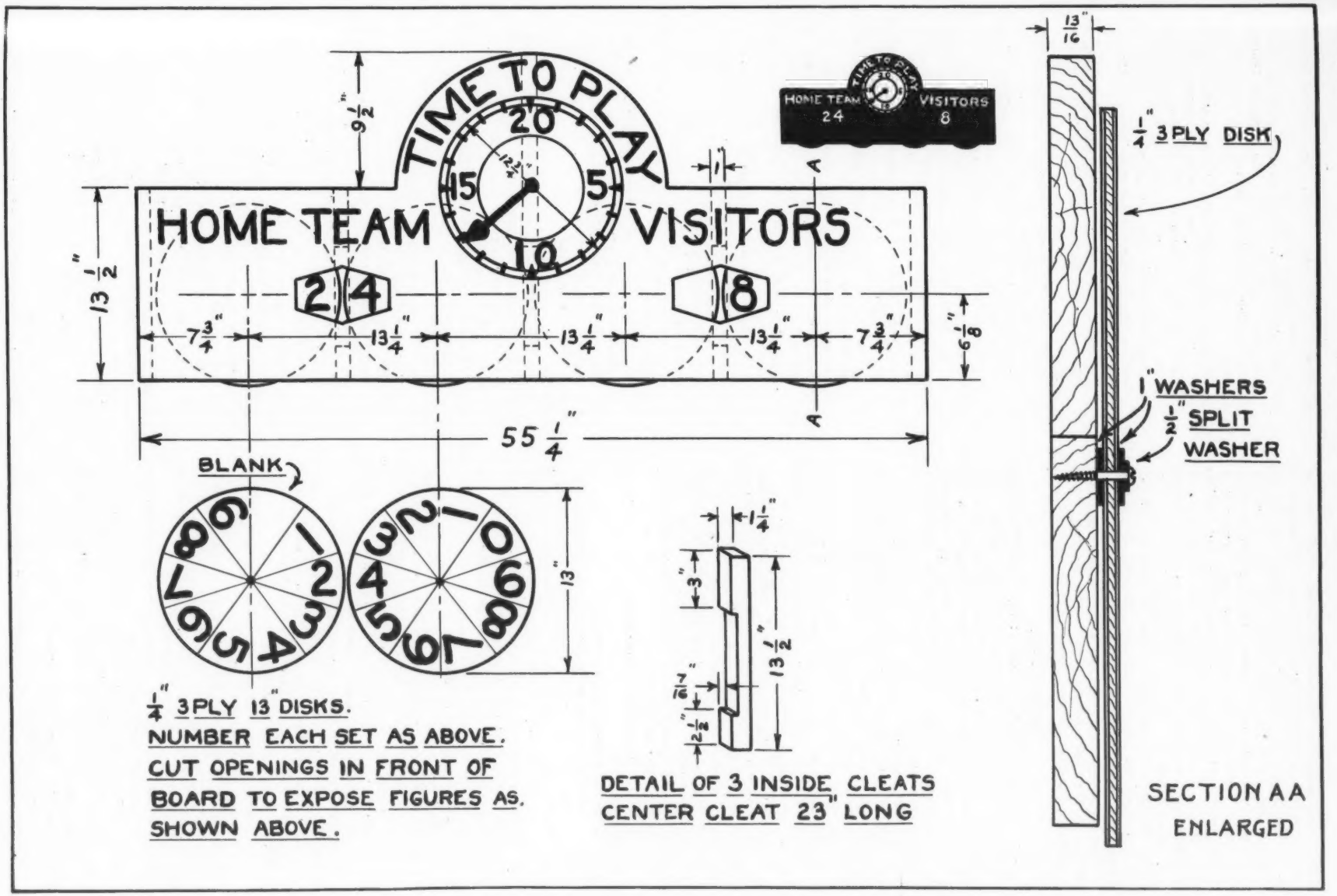
It will be noticed that the top is chamfered all around on the under side, thus giving a much lighter appearance to it without decreasing its strength.

In assembling, first start the legs into the holes bored in the under side of the top, but do not drive them in very far. Then glue and fasten the stretchers together. This assembly can now be started into the holes that have been bored into the legs. After a little glue has been carefully put on the tennons, the legs can be driven home. As they are being seated, a clamp can gradually tighten up on the joint between the legs and the short stretchers. After the glue has hardened, the footstool is ready to receive a finish. The use of an amber-colored, or Van Dyke brown stain, is suggested, if the above mentioned woods are used.

BASKETBALL SCORE BOARD

Jos. J. Lukowitz, Milwaukee, Wis.

Scores, whether baseball, basketball, or football, are always interesting to the players and spectators and a good score board, while it adds nothing to the score, adds greatly to the convenience of keeping score.



BASKETBALL SCORE BOARD, DESIGNED BY JOS. J. LUKOWITZ, MILWAUKEE, WIS.

The board illustrated herewith is always ready for use, neat in appearance, and simple to construct and operate. If desired, the time dial could be painted down lower on the center of the board. The semicircular top part could then be left off. Paint the entire board, including the revolving disks, black. Make the time dial white and number it in black. Paint the figures on the revolving disks white and use white for all of the other lettering. For different teams within the same school it may be desirable to use the proper team names instead of "Home Team" and "Visitors." Any number of different team names could be used by printing them on wood or heavy paper and hanging them over "Home Team" and "Visitors."

A feature of this board is that it can be fastened quite high up on the wall, within easy vision of players and spectators, and yet be operated from the gym floor.

END TABLE

Dean E. Johnson, Gardner High School, Gardner, Mass.

The end table has always been a popular project with woodworking classes. We have made various types and designs, but being handicapped by lack of machinery, we had to design a table that can be made by hand and with hand jigs. The work of designing and drawing is done in the mechanical-drawing classes.

The table described herewith, may be made with hand tools. The finished product compares favorably with trade products. The two-toned finish adds distinction and makes it match with up-to-date furniture.

While the first of these tables were made by the individual method, a large number have since been turned out on the shop-production plan. Both methods have been found productive of uniform results and good workmanship.

The two-tone design can be varied. Instead of imitating inlay, the design on the top and legs can be inlaid with a different shade of wood, or wood of a different grain. Then again, veneer, about one sixteenth of an inch thick, can be cut to the shape and design wanted, and glued on the tops and ends of the table. This gives a raised effect, and when finished, a lighter shade than the body of the table, makes a very pleasing piece of furniture.

Method of Procedure

Study the blue print.

For stock, use whitewood, birch, or maple.

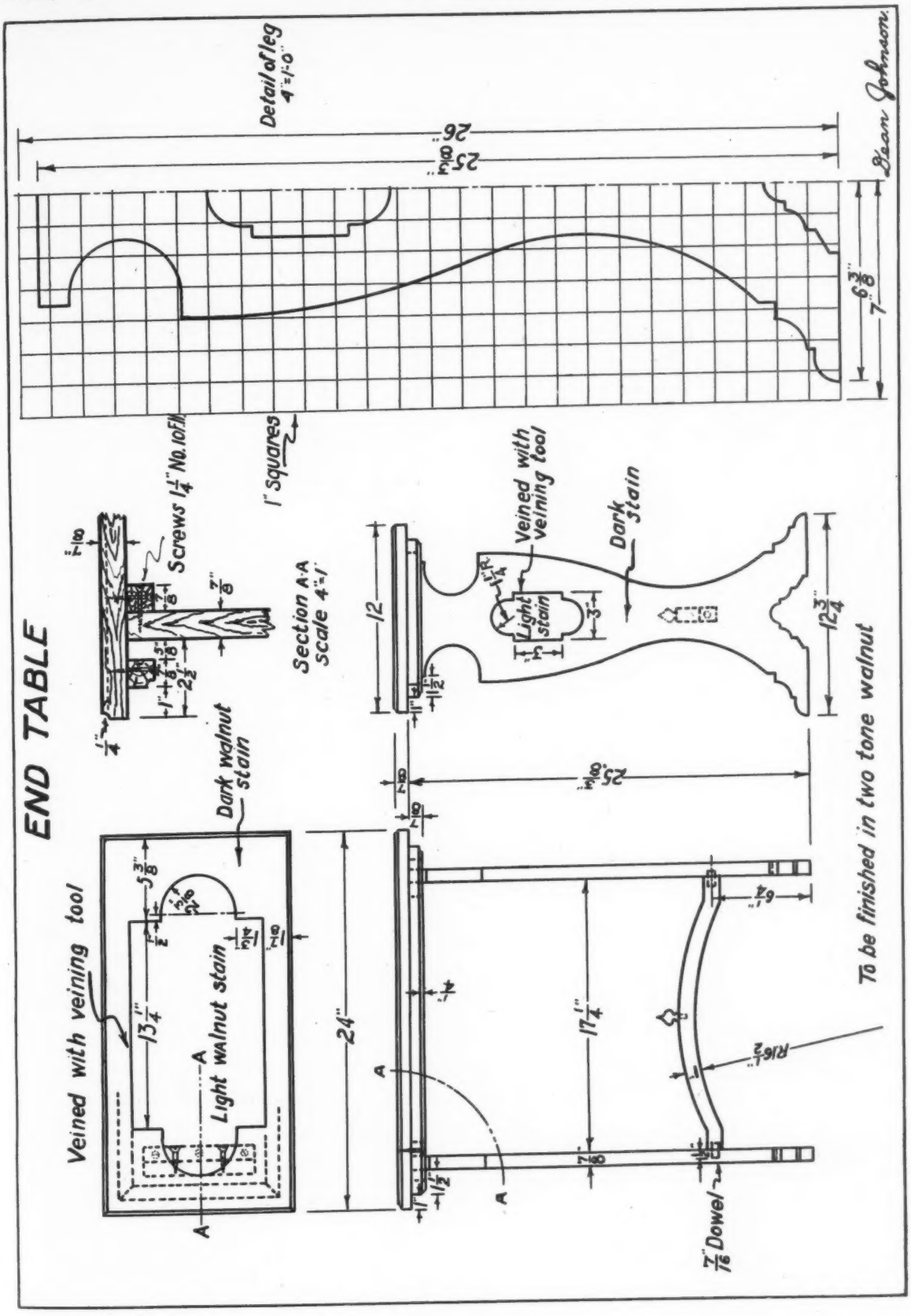
1. *Legs.* Glue up the stock for the legs, and finished to 7/8 by 12¾ by 25⅜ in.
   - *a*) Make a heavy paper pattern for the legs, and trace it on the lumber. Then cut out close to the line, using a turning or webb saw. A coping saw may be used for cutting out the smaller arcs and curves.
   - *b*) File to line, using a half-round wood file in concave curves.
   - *c*) Sandpaper very carefully.
   - *d*) Make heavy paper pattern for the design on the leg. Trace this on the leg and vein out on the line with a veining tool; or scribe deeply around the pattern with a scriber, making a deep impression.
   - *e*) Bore the ⅞-in. hole, ½ in. deep, into the inside of the legs, for the dowels which go into the stretcher.
2. *Top.* Glue up the stock to finish 7/8 by 12 by 24 in.
   - *a*) Cut the ¼-in. concave bead, around the top edge. This can be done with a 45 combination plane, or small, motor-driven hand beader and router.
3. *Rail.* Around underside of top.
   - *a*) A piece of 7/8-in. square stock 6 ft. long, with a ¼-in. concave bead on one corner.
   - *b*) This rail sets in 1 in. from the edge on the underside of the top.
   - *c*) Cut the two side rails on a miter of 45 deg., extreme length 22 in. Cut two end rails 10 in. long.
   - *d*) Now drill 4 or 5 ⅞-in. holes up through the bottom of each rail, and countersink.
   - *e*) Screw the rails in place on the bottom of the table top 1 in. from edge, using ¼-in. No. 8 f.h.b. screws.
4. *Stretcher.* Lay out, using radius and lengths as shown in illustration.
   - *a*) Saw out with a turning saw.
   - *b*) File and sandpaper.
   - *c*) Bore a ⅞-in. hole, ¾ in. deep, in the center of each end.
   - *d*) Bore a ⅜-in. hole, ⅜ in. deep, at the center of stretcher for the ornament.
   - *e*) Turn out a small knob or spire ornament to place at the center of the stretcher. The ornament should be 1⅛ in. wide and 1½ in. long.
5. *Assemble.*
   - *a*) Screw a ⅞-in. square cleat to the top end of the legs, as shown in the section view in the illustration.
   - *b*) Place the legs in position 17¼ in. apart, and square, then fasten them by putting 1¼-in. f.h.b. screws through the cleats into the underside of the top. Do not tighten up the screws until the stretcher is in place.
   - *c*) Cut two ⅞-in. dowels 1 in. long, and glue them into the ends of the stretcher. Then put the stretcher in place.
   - *d*) Be very careful when clamping, that the parts are clamped up square.
   - *e*) Tighten up the screws in the cleats holding the legs to the top.
6. *Scraping and Sandpapering*—Sharpen Scraper.
   - *a*) Scrape out all plane marks and other imperfections, being careful that the scraper itself does not leave a mark, caused by letting a corner of the plate dig into the wood.
   - *b*) Sandpaper, using No. 1 sandpaper over a block with rounded corners. It should be preferably a felt-covered block. Be sure all plane, scraper, and other marks are sanded out.
   - *c*) Sandpaper next with No. ½ sandpaper, sanding out all coarser sandpaper marks and imperfections. Remember that the sanding of a job properly and thoroughly is all-important in obtaining a fine piano finish.
7. *Varnish—Piano Finish.* Two-Tone Walnut Finish.
   - *a*) Apply a walnut oil stain to inside of design on top and legs of table.
   - *b*) Wipe off quickly with a cloth, in order to give it a lighter effect.
   - *c*) Apply to all parts outside of designs a penetrating walnut stain.
   - *d*) Be very careful to cut only to the veining of the design with the stain brush. Do not run over. Do not wipe off this stain unless it is cloudy or lapped in places.
   - *e*) Let dry twelve hours.
8. *Shellac.*
   - *a*) Use white shellac, thinned with 50-per-cent alcohol.
   - *b*) Apply quickly, but completely, one piece at a time. Do not touch up the work, as it will cause a lap.
   - *c*) Let dry two hours.
   - *d*) Sandpaper very lightly with 2/0 sandpaper, holding sandpaper on the fingers of your hand and pressing very lightly.
   - *e*) Dust off all dirt and particles.
9. *Varnish.* Use a good grade of rubbing varnish.
   - *a*) Thin with turpentine, if necessary.
   - *b*) Apply in a dust-free room at a temperature of 80 deg. Flow on carefully, but not too much to cause runs. Be careful not to leave untouched spaces.
   - *c*) Let dry 72 hours in 80-deg. temperature. Sandpaper lightly with 2/0 sandpaper and linseed or rubbing oil.
   - *d*) Apply two or three coats of varnish repeating the operations outlined under *a*, *b*, and *c*, of this section.
   - *e*) Use 2/0 sandpaper for sanding the last coat.
   - *f*) Rub with powdered pumice stone and oil, using a felt pad for rubbing.
   - *g*) Rub with powdered rottonstone and water.
   - *h*) Polish thoroughly with soft dry cloth.

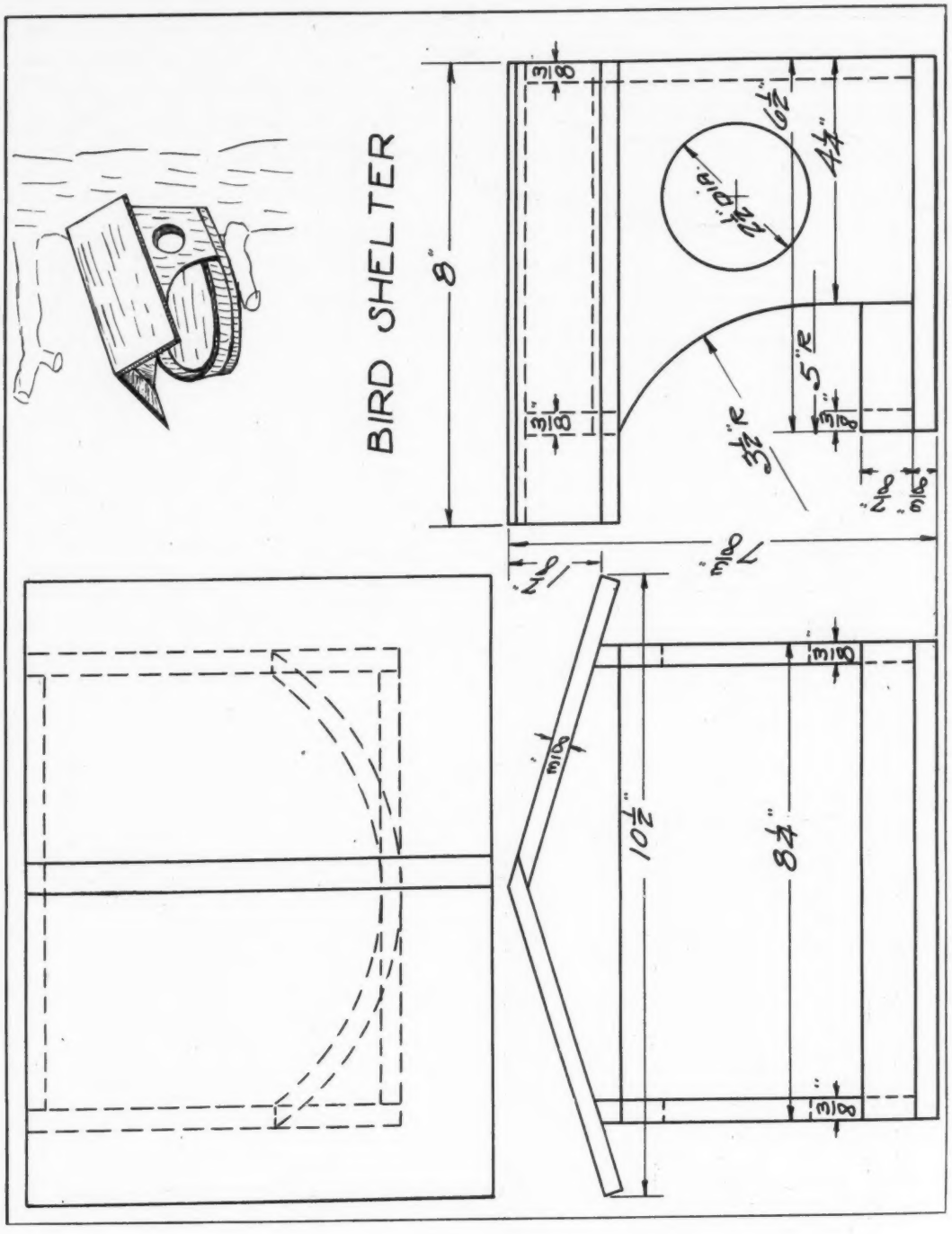
Bill of Material

1 pc. 12	x 24	Top
2 pc. 12¾	x 25⅜	Legs
1 pc. 4	x 17¼	Stretcher
2 pc. 10	x ⅞ sq.	End Rails
2 pc. 22	x ⅞ sq.	Side Rails

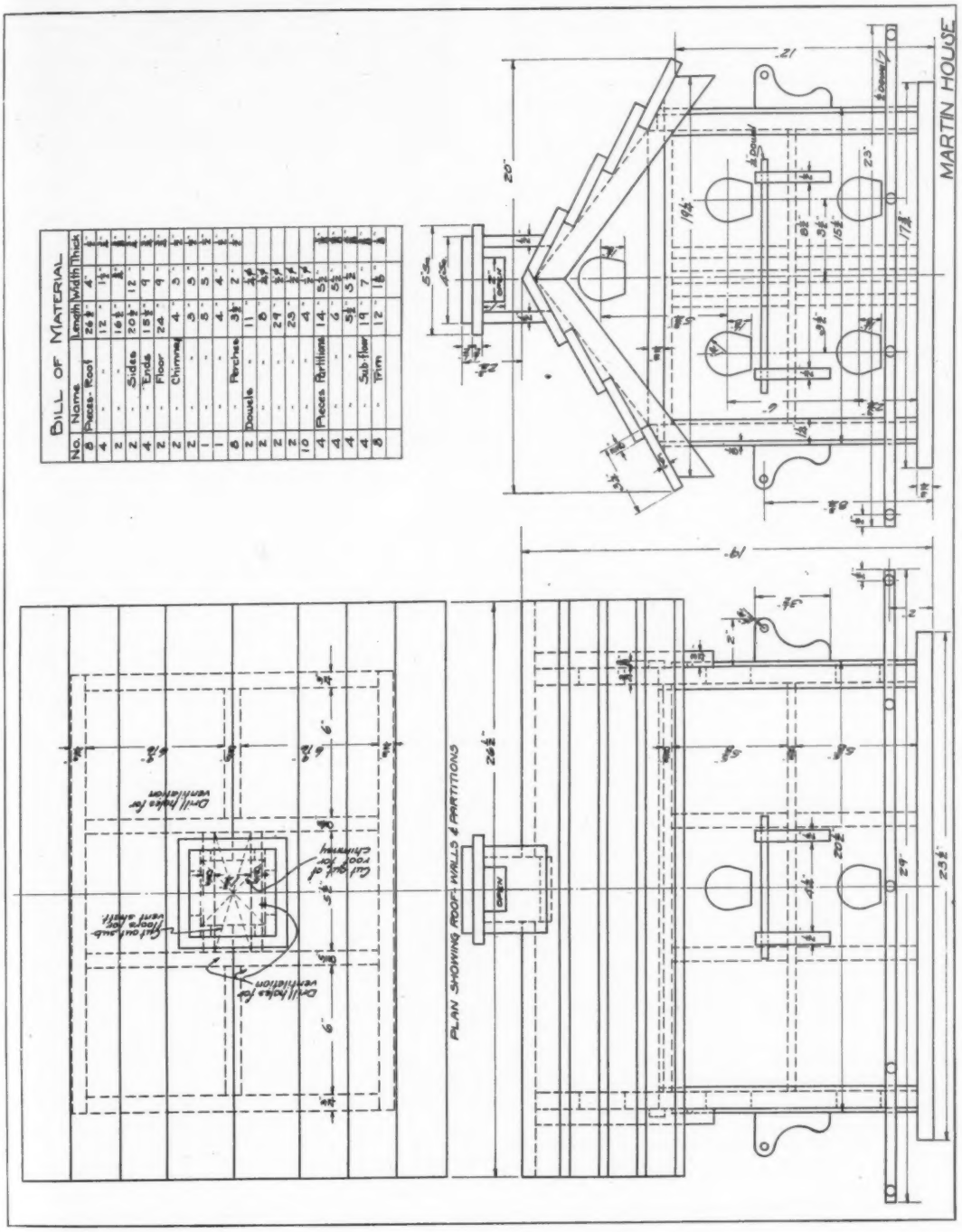
½ pt. Walnut Stain
½ pt. Shellac
1 pt. Varnish

Have the pupils figure the cost of the material. The final cost is obtained by adding 10 per cent for overhead.


END TABLE
Detail of leg
4"=1'-0"
Beau Johnson
26"
25" dia.
6 3/8"
7"
1" Squares
Screws 1 1/4" No. 10 FH
Section A-A
scale 4"=1'
Dark walnut stain
Veined with veining tool
Light walnut stain
Veined with veining tool
Dark stain
Light stain
12
12 3/4"
25" dia.
24"
17 1/4"
6 1/4"
R16 1/2"
7/16" Dowel
To be finished in two tone walnut



DESIGNED BY EDW. F. WORST, DIRECTOR OF MANUAL TRAINING, CHICAGO, ILL.


MARTIN HOUSE
PLAN SHOWING ROOF, WALLS & PARTITIONS
Drill holes for ventilation
Cut out roof for chimney
Cut out sub floor for vent shaft
Drill holes for ventilation

BILL OF MATERIAL

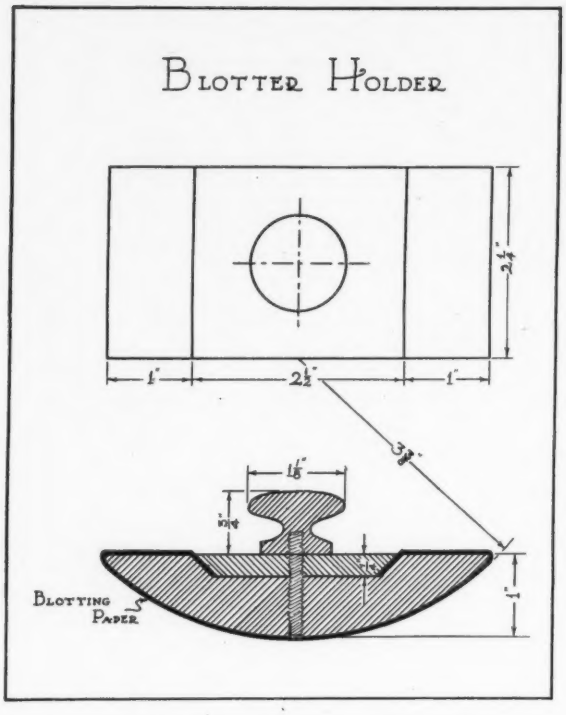
No.	Name	Length	Width	Thick
8	Pcs. Roof	24"	4"	1"
4	" "	12"	1½"	1"
2	" "	16½"	1½"	1"
2	" Sides	20½"	12"	1"
4	" Ends	15½"	9"	1"
2	" Floor	24"	9"	1"
2	" Chimney	4"	5"	1"
2	" "	8"	5"	1"
1	" "	8"	5"	1"
1	" "	4"	4"	1"
8	" Perches	3½"	2"	1"
2	Doubls	11"	4½"	1"
2	" "	8"	4½"	1"
2	" "	24"	3½"	1"
2	" "	25"	3½"	1"
10	" "	4"	1½"	1"
4	Pieces Partitions	14"	5½"	1"
4	" "	6"	5½"	1"
4	" "	5½"	3½"	1"
4	" Sub floor	19"	7"	1"
8	" Trim	12"	1½"	⅜"

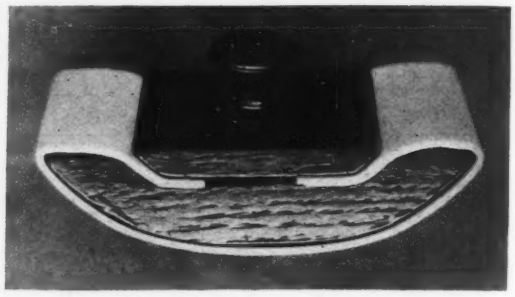
DESIGNED BY EDW. F. WORST, DIRECTOR OF MANUAL TRAINING, CHICAGO, ILL

BLOTTER HOLDER

J. I. Sowers, Director of Vocational Education, Miami, Florida

Ever since manual training has been taught in the schools, a blotter pad of some kind has been an important project in the early grades. It seems almost impossible that a new and interesting form of this old project could still be devised. The accompanying drawing, however, presents what we believe to be a new departure in the form of this old exercise. It is true that this is a little more difficult to make than the blotter pads that have formerly been used. This, to our mind, makes it a better and more valuable exercise. When it has been finished in an acceptable manner it has a very pleasing appearance, and we have found it very valuable as a project in the grades 7 and 8.





AN ELECTRIC PYROGRAPHY OUTFIT

E. A. Rerucha, Wakefield, Michigan

In the 1929 catalog of Thayer and Chandler, Chicago, we find this interesting story of pyrography:

"Pyrography, poker painting or wood etching is the art of decorating wood, leather, or cardboard by the means of heat, the design being burnt into the article to be decorated.

"The origin of this unique scheme of decoration is not as obscure as it might at first sight appear; the story is rather interesting. In the days when authors and artists assembled in the taverns (which, by the way, were also clubhouses) it was the custom of artists—who might be among those assembled—to sketch on the wall with a hot poker, scenes depicting the subjects suggested by the discussion.

"A poker would be heated red-hot in the fireplace, and with it they sketched the creation of their fancy.

"Modern pyrography is done with a platinum point by first heating it over an alcohol lamp flame, then feeding it gas fumes from the bottle of gasoline by means of a rubber bellows."

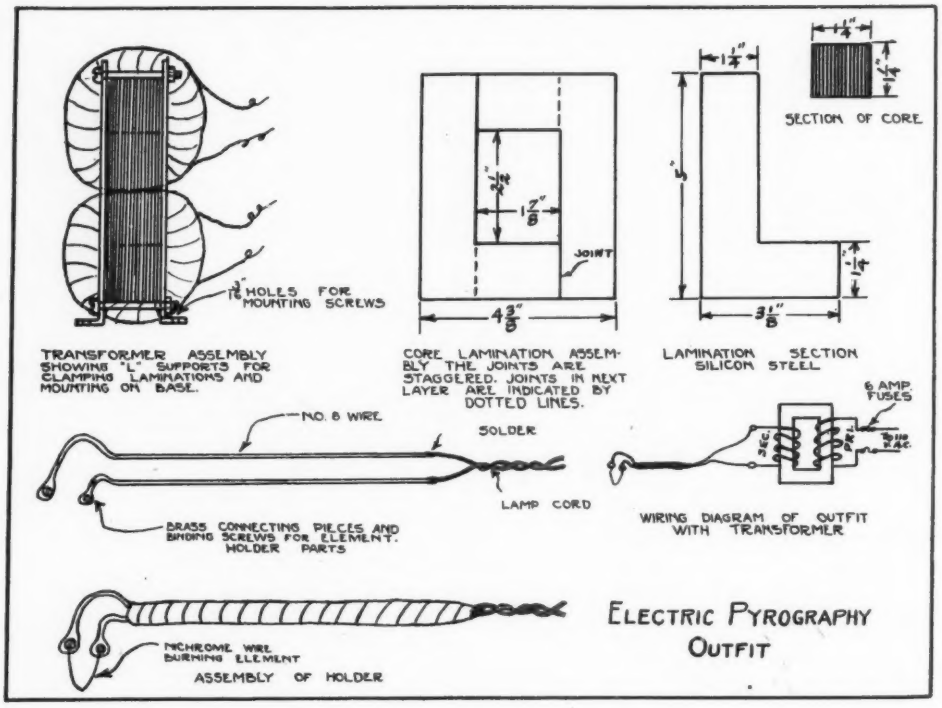

¼" HOLES FOR MOUNTING SCREWS
TRANSFORMER ASSEMBLY SHOWING "L" SUPPORTS FOR CLAMPING LAMINATIONS AND MOUNTING ON BASE.
JOINT
CORE LAMINATION ASSEMBLY THE JOINTS ARE STAGGERED. JOINTS IN NEXT LAYER ARE INDICATED BY DOTTED LINES.
SECTION OF CORE
LAMINATION SECTION SILICON STEEL
NO. 8 WIRE
SOLDER
LAMP CORD
BRASS CONNECTING PIECES AND BINDING SCREWS FOR ELEMENT. HOLDER PARTS
6 AMP. FUSES
WIRING DIAGRAM OF OUTFIT WITH TRANSFORMER
NICHROME WIRE BURNING ELEMENT
ASSEMBLY OF HOLDER
ELECTRIC PYROGRAPHY OUTFIT

FIG. 1

Pyrography was a popular method of decoration some few years ago and pyrography outfits of the gasoline or benzine type are still obtainable on the market although they have advanced in price considerably. This is principally due to the fact that the cost of platinum has gone up in price during the past ten years or so.

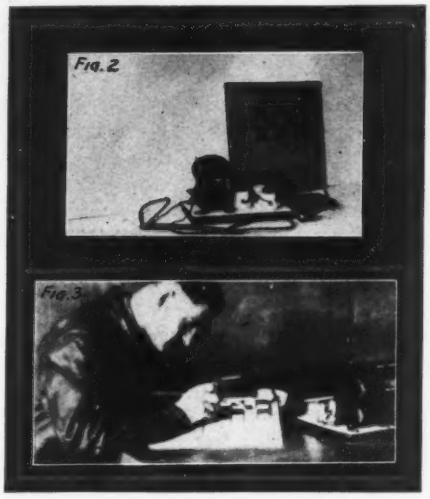


FIG. 2. THE PYROGRAPHY OUTFIT
FIG. 3. THE OUTFIT IN USE

There may still be some, like the writer, who may occasionally desire to use a pyrography outfit although the use would not justify the expense of purchasing one, and it is for this reason that the electric outfit described in this article was designed and is presented to the readers of this magazine. The outfit is inexpensive, the materials are readily obtainable, and the cost of operation is very little. The essential parts are a nichrome wire burning element, a suitable holder with attachment cord, and a 6-volt storage battery or step-down transformer providing a source of current of at least six and a half volts. The drawing in Figure 1 gives the construction details for the holder and transformer core and the wiring diagram.

For the burning element the writer used 4 in. of No. 28 nichrome wire doubled and twisted together. Other sizes of wire may be used, the length to be used so that the wire will heat up to redness will vary with the size of wire, although if an element over 4 in. long is used it will be found to be too limber. The proper length of the element may be determined by trial—if the wire fails to heat to a burning heat, the element should be shortened; if it heats up too much or burns up, the element should be made longer. Following is a suggestive table of approximate lengths and sizes of wire that may be used, the final length for each to be determined by trial.

Size of Wire	*Length of Wire*	*No. of Wires Twisted*
No. 25	4 in.	1
No. 28	4 in.	2
No. 30	4 in.	3

The burning element may be bent to various shapes, such as curves, V-shapes, pointed, etc., depending on the design to be burned.

The holder for the burning element is made from two pieces of No. 8 or No. 10 brass or copper wire about 8 in. long and bent to the shapes shown in the drawing in Figure 1. Solder the straight end of each piece to one conductor of about 4 ft. of lamp cord. To each of the bent ends solder a short piece of about No. 8 gauge brass, 5/16 in. wide, drilled and tapped for a small machine screw for fastening the nichrome-wire element. The binding screws and the brass pieces from an old porcelain lamp receptacle will do nicely for this purpose. The two wire pieces of the holder are each taped separately with two layers of asbestos tape and a layer of friction tape and then bound together with about two layers of friction tape. The asbestos tape should be used as the holder may get quite warm from continuous use which would cause the friction tape on the handle to become sticky. The nichrome element is fastened under the screws, and if a storage battery is to be used as a source of current, the two remaining ends of the lamp cord are attached to the battery posts and the outfit is ready for use.

If the house-lighting system is to be used as the source of current, a transformer is required. This is constructed according to the following specifications and as shown in the drawing. The core is made up from the laminations of an old distribution transformer or from sheet silicon steel. The laminations are cut to the shape and size indicated. Enough should be cut to make the thickness of the core 1¼ in. on a side. When assembling, the laminations are put together so that the joints are staggered. The primary winding consists of 580 turns of No. 20 d.c.c. magnet wire and the secondary of 155 turns of No. 15 d.c.c. magnet wire. About 6 in. of the ends of each winding should be left for making the connections. The assembled transformer is clamped between the L-shaped supports and mounted on a base board ¾ by 6 by 10 in. A 6-ampere fuse is provided in the primary circuit as shown in the wiring diagram in Figure 1 and binding posts for the secondary to which the lamp cord from the burning element is connected.

This transformer is identical in design to the transformer used with the battery charger described by the writer in the February, 1928, issue of the INDUSTRIAL-ARTS MAGAZINE, except that the filament heating winding consisting of ten parallel turns of No. 14 wire has been omitted. The February article also gives complete details for winding and taping the coils and assembling the core.

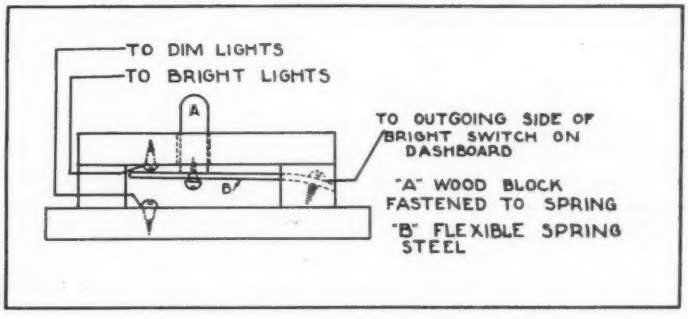
The suggested lengths and sizes of wire given in the table should work with either the battery or the transformer. However, as stated above, if the element fails to heat up to the proper burning heat, the proper length may be determined by trial.

The photographs in Figures 2 and 3 show the outfit as completed and in use.

A FOOT SWITCH FOR DIMMING LIGHTS

Kenneth W. James, Detroit, Mich.

This simple switch makes dimming the lights a safe proposition because it can be done while both hands are kept on the wheel.



FOOT SWITCH DESIGNED BY KENNETH W. JAMES, DETROIT, MICH.

The parts, with the exception of the spring steel and the screws, are made of any wood that does not split easily. When the parts have been made ready to assemble, all the wood parts should be given a heavy coat of shellac to prevent a short in the circuit. If blued screws are used for the terminals, they must be filed bright both on the head and the underside where the wire is attached. If the spring B does not give a strong enough contact, a small coil spring may be fastened between the spring and the base.

When the dash switch is on bright, the current is going through this foot switch with B in the upper position. By stepping on button A, the current goes through the dim lights when B is in the lower position. Be sure the wire is well insulated. This switch may be used on any lights where two separated wires are used in the bulb to give the dim and bright lights. It will not work where a resistance coil is used with the wiring given here.

COMBINATION FOOTSTOOL AND MAGAZINE HOLDER

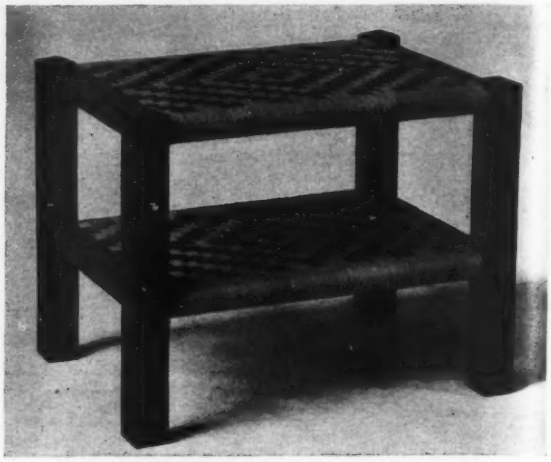
Paul N. Wenger, Supervisor of Manual Arts, Greenwich, Connecticut

The footstool described herewith is a project which requires twice as much caning work as is ordinarily required on a footstool. It makes use of the space ordinarily wasted in footstool designs, and puts it to good use as a magazine and paper holder.

Due to the fact that the dowels are 1⅜ in. in diameter, with a ⅛-in. shoulder at each end, it becomes necessary to turn them out on the lathe. The ends of the dowels should be mitered so as to form a tight joint.

Either one of the designs that are shown for the "Child's Caned Footstool" on page 79 of the February, 1929, issue of the INDUSTRIAL-ARTS MAGAZINE, may be used upon the upper and lower shelf of this footstool. As the seat and shelf are rather large, it increases the appearance of the finished caned surfaces if the blocks in the designs are also made larger. By using double strands the size of the blocks become twice as great. The caning on the lower shelf should be finished before the caning on the seat is started.

For the given designs use 19 double strands (38 strands) of stained cane running lengthwise; and 27 double strands



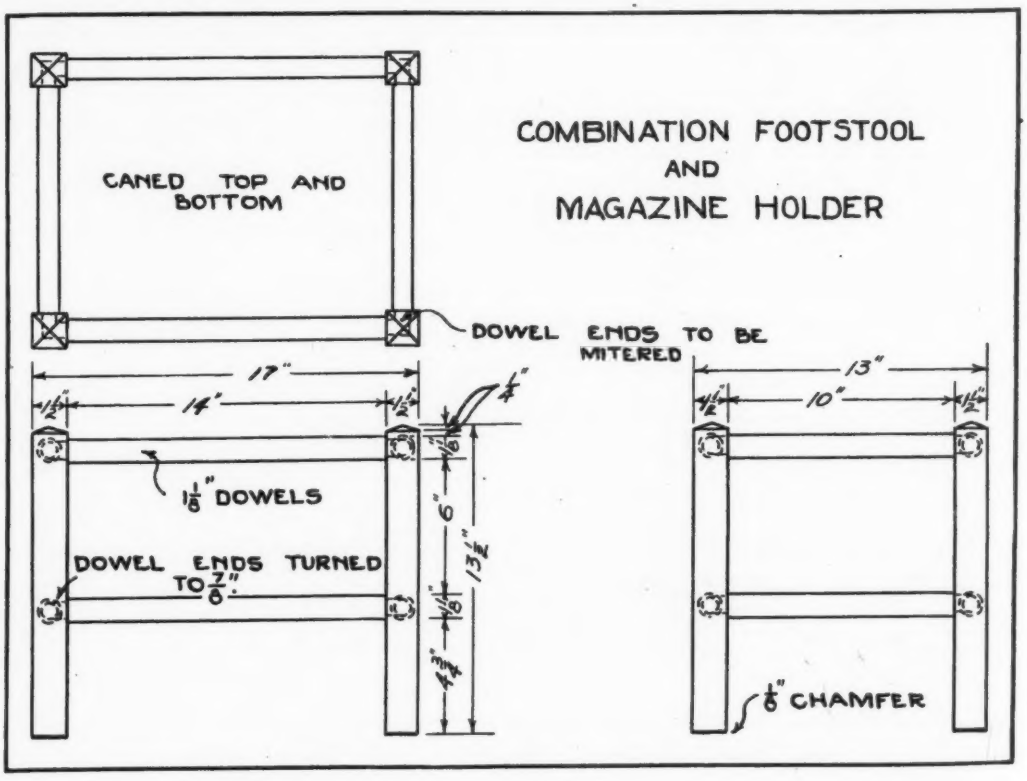
THE FINISHED PROJECT

(54 strands) of natural-colored cane running crosswise. The dimensions given in the illustration allow the proper number of strands to be used so as to form the given caning designs. The procedure for caning is similar to that used on the small stool described in the February, 1929, issue of this Magazine, excepting that it is necessary to use two strands to form each block in the design. Again, a definite number of strands are required to form the designs. In using any other design, it is well to remember that the flat fiber cane is usually slightly wider than ¼ in. If this is not observed, the caning may become extremely tight, and may thus cause considerable difficulty.

GARDEN GALLEON

Leon H. Baxter, Western Reserve Academy, Hudson, Ohio

This interesting model looks very pretty when placed on an arched trellis or on a summer house in the garden.



It is best made of white pine, the hull being ¾-in. stock and the sails ½-in.

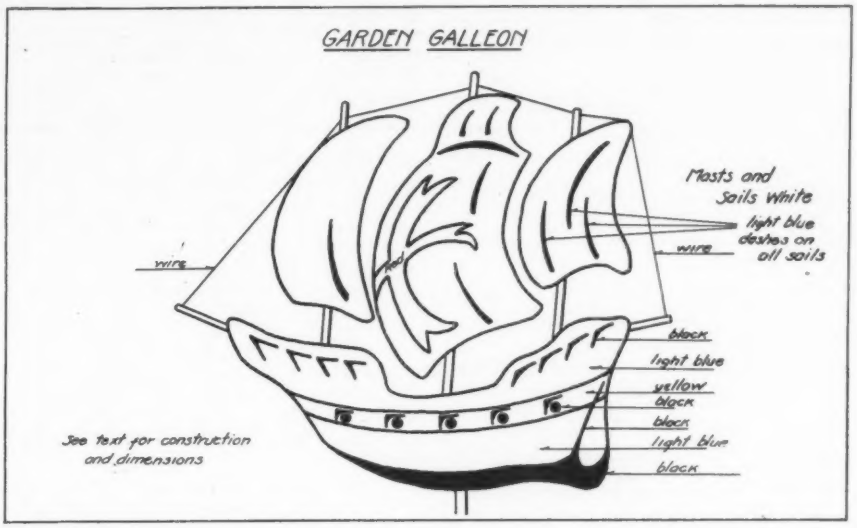
In starting, it is best to cut a rectangular piece of ⅞-in. wood, 6 in. wide by 13 in. long. Plane both surfaces until it is ¾ in. thick.

The outline of the hull is very irregular. After locating a few definite points, the general shape may be sketched in lightly, free-hand, so that necessary corrections may be made before it is sawed out. The bow should be established as the upper left-hand corner of the piece of wood. The top of the stern is 5¼ in. up from the right lower corner.

COMMON-SENSE SUGGESTIONS FOR INDUSTRIAL ARTS

H. R. Troyer, Instructor in Industrial Arts, Bowling Green, Ohio

I once saw an article entitled "Some suggestions concerning the psychological approach to the teaching of science in the junior high school," which sounds very much like the title to a master's thesis or a doctor's dissertation. I have therefore refrained from using such words in my title and am calling it simply "Common Sense Suggestions for Industrial Arts."



The lower part of the deck line, or point over the line of cannons, is 3 in. from the lower edge of the block of wood. From the bow to the point where the outline curves down to the deck line is 5¼ in. From this point to where the deck starts to curve up toward the stern is 3 in.

From the left-hand lower corner measure to the right 5 in., and from this point the keel curves up toward the bow, following the outline shown. The rest of the shape can be quite easily sketched.

Cut out the form with either a coping or a turning saw, taking pains to keep all edges square. Smooth up with a file and sandpaper.

The masts are made of ¼-in. dowel rod, the main mast being 8 in. long. The mizzenmast 11 in., and foremast 8 in.

The holes for these masts are bored with a ¼-in. bit, 1 in. deep, sloping the bit so the masts pitch to the rear, as shown.

The main mast hole is bored 2½ in. from the stern, the mizzenmast 3 in. from this, and the foremast 4¼ in. from the mizzenmast.

The bowsprit is bored with the same size bit, as shown, and is 3 in. long. The dowel in the stern is likewise 3 in. long.

Great care must be taken in boring the holes through the sails for the masts.

The sails are made of ½-in. pine. The small rear sail requires a piece 3½ by 5½ in., the sail on the mizzenmast 5 by 8 in., and the foresail 3 by 5 in. These shapes also are sketched free-hand, and then cut out.

After all parts are carefully sanded, the next step is to paint the boat. Give all spars and sails two coats of outside white paint and the hull two coats of light blue, rubbing down between coats with fine sandpaper. After these coats are dry, the project is ready for the final decorating. Use the colors indicated on the drawing. The fine sketchy lines should be placed on with a small, fine, pointed brush. The circles for the cannons can be placed neatly by dipping a ½-in. dowel rod in black paint and using it as a print stick. If the galleon is to be used out of doors, bore a ½-in. hole, 1½ in. deep in the keel, for a piece of ½-in. dowel rod, 3½ in. long. Bore a similar hole wherever the model is to be placed, deep enough so that the keel will just touch the place on which it is to rest.

1. When you are almost discouraged because a boy cannot saw a board square or drive a nail straight, try it yourself, using your left hand.
2. Remember that a boy doesn't like a job because you think it should be done. Motivate it from his point of view.
3. When you have a sudden inspiration to make a flower trellis or window box for your home, do you spend a couple of weeks making and inking in a drawing for it?
4. If a boy makes a good suggestion, use it and don't be afraid to let him know it is his.
5. An instructor that makes his own models of projects gets a first-hand knowledge of the difficulties encountered by the students.
6. There is a satisfaction in being dressed for the occasion. A department-store floorwalker would look and feel out of place in overalls.
7. If a boy is able and has the opportunity to seek out and answer his own questions, it is better for him and gives the instructor more time for other duties.
8. A teacher is not so apt to be cross and irritable the last period of the day if he has an appointment at the tennis courts or golf links at four o'clock.
9. Just because it makes it easier for the teacher, is not sufficient reason to compel each pupil in the class to work on the same project at the same time.
10. A boy's idea of "good enough" in the shop is about the same as a teacher's idea of "good enough" on a job about the house.

SOME QUESTIONS FOR THE PLUMBING CLASS

George C. Donson, Washington, Pa.

1. Is the atmospheric pressure greater or less at the top of a mountain than it is at sea level?
2. Name four things which may cause a trap to siphon.
3. Of what material should a soldering-union washer be made?
4. How may the shape of brass pipe be retained while it is being threaded?

5. What coins are often used as tools? What other service do they often render to the plumbing trade?
6. How can a poured horizontal joint be smooth faced?
7. How can marred ground joints be made tight?
8. How may cutting oil be thinned in cold weather?
9. Should sheet lead in hub flashings be caulked pressure tight? Why?
10. What type of gasket would you use on a misaligned lip union?
11. How would you grind a twist drill for marble; slate; glass?
12. What is the usual cause of a "killed circulation"?
13. What value has "water hammer"?
14. What must you allow for besides expansion in building construction?
15. How would you test a suction line?
16. Is a three-wheel pipe cutter used at the bench?
17. How is lead and cast-iron pipe connected?
18. How should measurements be taken in cutting pipe to length?
19. What is the difference between siphon jet and siphonic action?
20. What is the cause of a "singing noise" sometimes found in the water-closet tank?

MARBLE GAME BOARD

C. Anthony Van Kammen, Harrison Park Junior High School, Grand Rapids, Mich.

The woodshop teacher can never have too great a number of good games to offer to the boys, either as a merit problem for excellent work, or as a problem for the entire class. The marble game offered herewith has proved very satisfactory both to the boy and to the teacher. It involves the use of the plane, marking gauge, square, and knife for bringing stock to finished dimensions, and has plenty of measuring practice in the marble interference layout. Driving the nails in the base for the marble interference provides excellent practice in the use of the hammer. The groove in the base, to receive the leg stretcher, offers a chance to prove ones skill in the use of the back saw and chisel, while paring with the chisel is part of the work in making the marble stall partitions. To make the screw holes, a gimlet bit is required while the three marble holes in the end of the box need an auger bit. The base, if glued up of several pieces, permits

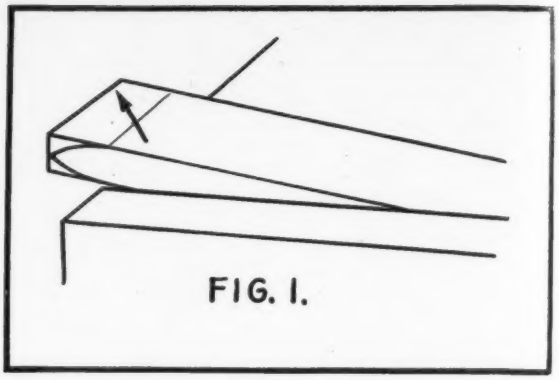


FIG. 1.

the instructor to use up narrow widths of lumber and adds another problem for the boys' experience. If the work is done in a junior-high-school shop, where the workers have access to woodworking machinery, all lumber can be run to very near correct size so that a little hand planing and sanding will remove all mill marks.

The bill of material shows the finished sizes. Either pine or bass may be used.

1 pc.	17 x 9 x ½	Base
2 pc.	17¾ x 1½ x ⅜	Side
2 pc.	9 x 1½ x ⅜	Ends
8 pc.	2 x ⅞ x ¼	Marble stall sides
2 pc.	7⅜ x 1 x ⅜	Legs
1 pc.	10½ x ⅞ x ¼	Leg Stretcher

Hardware

29	1 in. No. 18 wire brads	Box assembly and stalls
35	1¼ in. No. 17 wire brads	Marble interference
18	¾ in. No. 18 wire brads	Stalls
2	¾ in. No. 6 R.H.B. screws	Leg supports

The greatest difficulty will be encountered in making the sharp ends on the marble-stall partitions. If the ends are pared off with a chisel from a long piece of stock, and the partition lengths cut off after the end is completed, no trouble will present itself. See that the piece is held low in the vise and almost in a horizontal position. Pare diagon-

The cots in this illustration were made by the vocational students in the cabinetmaking department of the J. Sterling Morton High School, Cicero, Ill. As shown they are used for a local welfare center. The frame work of the cots was made of birch and a heavy blue and white ticking was used for the cover. The work was done under the supervision of J. A. Williams, Instructor.

ally from the shoulder of the curve across the width of the piece toward the point end. See working drawing and Figures 1 and 2.

It is suggested that glue be used on all joints in combination with the brads. To assemble the box use three 1-in. No. 18 brads on each end into the base. Seven of the same size are used in each side, two through each end and three into the base. A 1-in. No. 18 brad is driven from the bottom into each stall partition, while two ¾-in. No. 18 brads are nailed through the end of the box into each member.

The holes for the screws upon which the legs swing are bored on the same centers as used for the radius in rounding the leg ends. With the legs folded in place the location of the screw hole in the box sides is easily found.

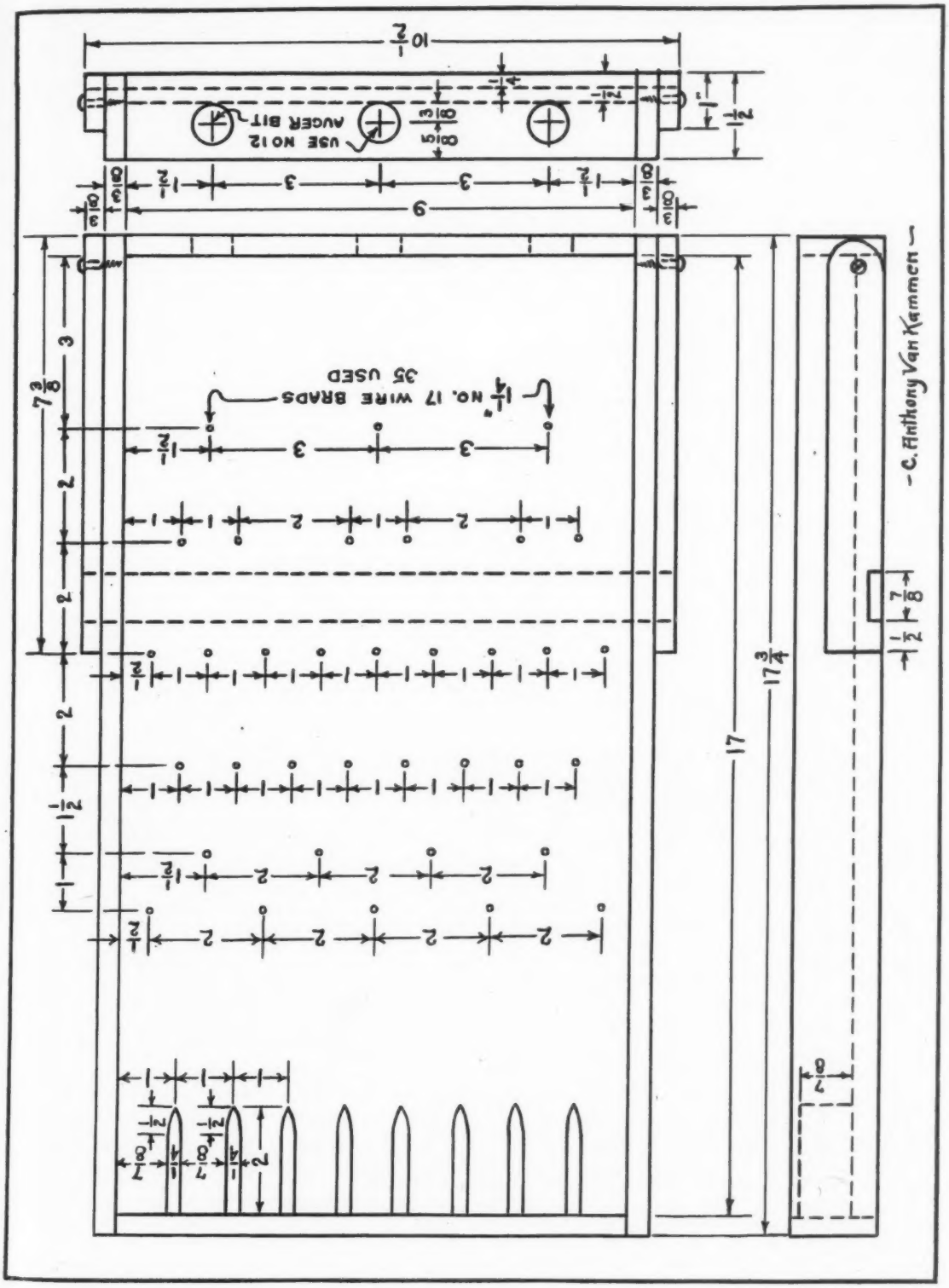


FIG. 2

Lacquer the inside of the game box one color and the outside in some color value that will harmonize with it. Color combinations suggested by the lacquer manufacturers on their color cards are very good. The interference brads may be driven a little ways into a scrap piece of wood and painted in a contrasting color. After they are nailed in their proper place on the game-board base, the nail heads may be touched up if necessary.

By placing odd numbers as values for the various marble stalls, the counting of the score will drill in the use of numbers. To increase the arithmetical value of this game board, minus and multiplication signs may be used with the numbers in the stalls.

ADHESIVES AND THEIR USES IN THE INDUSTRIAL-ARTS COURSES

R. J. Dunham, Public Schools, Pittsburgh, Pa.

There are many different kinds of adhesives, some of which can be readily adapted for use in industrial-arts courses, but the type of adhesive which should be used in any case depends upon the objects which are to be joined, and the use to which they are to be put.

Adhesives may be divided into two classes; namely, cements and glues. Cements, as a rule, do not penetrate the surfaces with which they come in contact. That is why they can be used to join nonporous materials. Glues, on the other hand, penetrate the surfaces which they bind. A glue, therefore, will not yield its best results when used with nonporous materials. This kind of adhesive probably finds its widest application in joining wood.

I. Animal Glue

The Different Kinds. There are many different kinds of animal glue. The term, "animal glue," may include any glue made from the bones, skins, etc., of cattle, goats, sheep, deer, horses, pigs, and rabbits, but the term, as usually applied, refers to cattle glue only. The value attached to the glues from these seven sources is indicated by the order in which they are named.

Various Forms. Glues are sold in the cake, flake, and ground form. It does not matter whether a particular kind is ground or not, but glue buyers are prejudiced against ground glue because it can be adulterated so easily. If the buyer, by a test, finds the ground glue is as good as it is represented to be, he will find it advantageous to use it in this form.

Method of Mixing. A mixture of 1 part of glue to 2¼ parts of water has been found to give good results when a high-grade hide glue is used. The proportion of glue and water to employ is largely a matter of experience, but it can also be determined by strength tests. "When the right proportions have been decided upon, they should be strictly adhered to thereafter. The glue and water should be weighed out whenever a new batch of glue is prepared. Clean, cold water should be used. The glue should then stand in a cool place until it is thoroughly water-soaked and softened. This may take an hour and it may take all night, depending upon the size of the glue particles. It should then be melted over a water bath, and the temperature not allowed to go higher than about 150 deg. F.[1]

Heating for a period longer than seven hours reduces the strength of glue solutions to a considerable degree. Therefore, in the manual-training shop, as elsewhere, it is advisable to make up a solution for one day's use, and not keep the same batch in use for several days.

Room Temperature. Room temperatures of 70 to 80 deg. F. are ordinarily satisfactory in conditioning the wood properly. It is not necessary to apply heat directly to the wood to be glued, as commonly supposed. In fact, tests conducted at the U. S. Forest Products Laboratory, tend to show that the best joint strength is obtained when the parts to be joined are not heated, but placed in a room at the temperature mentioned in the foregoing, long enough to be raised to that temperature. The length of assembly, i. e., the time elapsing between the time the glue is spread and pressure applied, with the room temperature at 70 to 80 deg. should be one to two minutes. Summer weather may change this ordinary room temperature to 85 and 90 deg., in which case the time for assembly would be longer. If the room temperature is above 80 deg., the assembly period should be 3 to 5 minutes, and at 90 deg., 7 to 10 minutes.

Pressure. The proper pressure to use is determined by the condition of the glue at the moment pressure is applied. In most gluing operations in the industrial-arts shop, pressures of 150 to 200 pounds per square inch will give good results. As Jorgenson and beam clamps exert a total pressure of 700 and 2,800 pounds respectively, the number of clamps necessary to clamp up a given glued surface, can be readily ascertained. The pressure should be evenly distributed over the joint so that the glued faces will be in contact at all points.

While it has been customary to keep pressure on the glue-joint for twelve hours or more, in the past, it is now no longer customary to do so, especially in industry where the time element is an important factor. While it is possible to obtain a strong glue-joint when pressure has been constant for five hours, nevertheless for schoolwork, where the time element is not an important factor, it is best to eliminate chance from the work by leaving the clamps on overnight.

II. Casein Glue

Another glue which has many desirable properties, and is coming to be used to a much greater extent than formerly, is the casein glue. This glue has been used commercially for a much shorter time than other glues, and its properties are not so well known. True, it has been used very little in the industrial-arts shop, but like animal glue, it has sufficient strength for both joint and veneer work. It is used cold, and spread with a brush, but perhaps its most desirable property is its high water resistance, which makes it suitable for gluing woodwork which is to be used in damp places.

Water Resistance. The water-resistant qualities of casein glue were well demonstrated by the acceptance test which the government imposed on plywood manufactured with this glue for use in airplanes. The plywood was boiled in water for eight hours or soaked in cold water for ten days. The plies showed no separation under this treatment and the glue was accepted as suitable for airplane use.

In order to properly mix this glue, a mixer similar to the cream whip, or egg beater used in the home, with a bowl container, is required. Brass, copper, and aluminum vessels should be avoided, but some form of mixer which will mix the glue thoroughly without lumps or foaming is desirable.

Prepared Casein Glues. The dry mix or prepared casein glues probably have a wider application to industrial-arts work because they are easily prepared for use. Directions for mixing these glues are furnished by the manufacturers. The principal points to be observed in the mixing of prepared casein glues are:

1. A thorough mixing of the dry glue from the container before adding to the water. This is advisable on account of the segregation of ingredients of different specific gravities which may occur during shipment. Sifting is not advisable, as it may remove from the glue some essential component.
2. Proportions of glue and water should always be weighed, not measured.
3. The glue should be added slowly to the water, accompanied by vigorous agitation in order to avoid a lumpy mixture.
4. After the glue is well mixed into the water, the stirring should continue more slowly until all particles are thoroughly dissolved and the glue appears of a smooth creamy consistency.
5. The desired consistency of the glue should be attained during the mixing and no attempt should be made to thin the glue should it become too thick in use.

[1] Hunt, Geo. M. and Jones, W. L. The Selecting and Testing of Animal Glue for High-Grade Joint Work. Madison, Wis. 1922.

No provision need be made for heating, as casein glues must not be heated.

Application of Glue. The glue may be applied with a wire or bristle brush, enough being spread to cover both surfaces of the joint.

Assembling. Fitness of a glue for use should be judged by its consistency; ordinarily, as long as it can be uniformly spread, a good glue will give good results. The assembly time depends upon several factors. The time should be correspondingly reduced if the wood of an open, porous nature and of a low moisture content, or if a thin spread or a thick, heavy glue is used. Pressure should be applied when the glue is yet in a wet condition. In general, if pressure is applied within 10 to 15 minutes, good results will be obtained.

Pressure. Glue joints made using a pressure of 75 to 100 pounds per square inch is considered ample, and the time under pressure may vary from ½ hour to a much longer period. As in the case of animal glue, where it is convenient to retain the work in clamps overnight, a better joint strength will probably result.

To avoid deterioration, the dry glue should always be kept in a cool, dry place.

Staining. All strongly alkaline glues, such as casein, will stain certain species of wood. The discoloration appears as a yellow or brownish stain along the glue line and on the faces of veneer work where the glue or the alkali from it has penetrated.

If a stain has appeared, it can be removed by sponging it with a solution of 1 oz. of oxalic acid in about 12 oz. of water. If this is not entirely effective, it may help to sponge the spot first with a solution of 1 oz. of sodium sulphate in 12 oz. of water, and then, while the wood is still moist, with the oxalic-acid solution. The oxalic acid should be carefully washed off after removing the stain, as its presence might interfere with subsequent woodfinishing processes.

Casein glue has come to stay. It serves a purpose for which no other glue will do. Its strength is fully as great as need be. Its water resistance is sufficient for all ordinary purposes, and it is easy to make and easy to use.

Casein and animal glue are clearly very valuable adhesives for the industrial-art shops.

Conclusions

1. A mixture of 1 part of animal glue to 2¼ parts water is a good proportion to use.

2. The glue and water should be mixed by weight and not by volume.

3. It should be heated over a water bath of a temperature not to exceed 150 deg. F.

4. Heating for a period longer than 7 hours reduces the strength of the glue solution to a considerable degree.

5. It is not necessary to apply heat directly to the wood to be glued, but rather, to condition the wood by leaving it in a warm room long enough for it to attain room temperature.

6. The length of assembly should be from 1 to 2 minutes in a room with temperature at 70 to 80 deg. F.

7. At 80 deg., the assembly period should be from 3 to 5 minutes and at 90 deg., from 7 to 10 minutes.

8. Heating the wood (where conditions make it necessary) to 120 to 150 deg. F. will give a range of from 12 to 18 minutes for assembling.

9. Pressures of 150 to 200 pounds per square inch will give good results when using animal glue.

10. As Jorgenson and beam clamps exert a total pressure of 700 to 2,800 pounds respectively, the number of clamps necessary to clamp up a given glued surface can be readily ascertained.

11. To eliminate chance, the clamps should be left on the glued wood overnight.

12. Casein glue has shown much strength after soaking plywood in which casein glue was used, for eight days. It recovers nearly all its original strength when redried.

13. The dry casein glue should be thoroughly mixed before adding to the water, because of the segregation of ingredients of different specific gravities in shipment.

14. As in the case of animal glue, proportions of glue, and water should always be weighed.

15. Casein glues must not be heated.

16. Good results will be obtained, ordinarily, if pressure is applied within 10 to 15 minutes when using this kind of a glue.

17. A pressure of from 75 to 100 pounds per square inch is ample.

18. The dry glue should be kept in a cool dry place to avoid deterioration.

19. Staining can be eradicated by use of a solution of oxalic acid and water.

20. A solution of sodium sulphate and water will cause the stain to disappear where the oxalic-acid treatment is not sufficient.

SAMPLES OF PEN AND INK RENDERING MADE BY THE STUDENTS OF THE ARCHITECTURAL-DRAWING CLASS, ABRAHAM LINCOLN HIGH SCHOOL, COUNCIL BLUFFS, IOWA. R. M. HAMMES, INSTRUCTOR.

ASSOCIATION & CONVENTION ACTIVITIES

THE SCHOOL CRAFTS CLUB MEETING

The New Year's meeting of the School Crafts Club of New York City was held on Saturday, January 19, in the Geneva restaurant. Mr. Arthur F. Hopper acted as chairman of the meeting.

Following the dinner, Mr. Frank E. Mathewson, of Jersey City, N. J., gave a talk on "What the Association is Trying to Do." The second speaker was Mr. Edward A. Ruether, who spoke on the subject, "The Responsibility and Influence of the Manual-Arts Teacher." Mr. Ruether pointed out that the lower mental group constitutes the larger portion of the voting population of the country and stressed the fact that these need the help of the manual-training teacher more than any other group, if for nothing else than their numerical possibilities. He urged that these boys be taken seriously and that an attempt be made to instill the idea that honest work, well done, and worthy of recognition, is of supreme importance. Mr. Edwin F. Judd gave a talk on "Model Airplanes in the Schools," displaying some excellent examples of the work of his boys in model making in the Montclair High School. The last paper of the evening was eliminated because of lack of time.—*George W. Renneman.*

ANNUAL GET-TOGETHER MEETING OF THE BOSTON VOCATIONAL EDUCATION SOCIETY

The annual get-together banquet and meeting of the Vocational Education Society of Boston was held on Saturday evening, January 12, at the Hotel Westminster. More than 150 members and guests were present at the banquet, which followed a social hour in the hotel parlors. The decorations for the dining room were arranged by a social committee, headed by Mr. Leslie Nutting, while Mr. Ralph W. Babb presided over the business meeting following the banquet.

RALPH W. BABB
President of the Boston Vocational Education Society

During the session, nine new members were received into the society. President Babb then introduced Mr. Robert O. Small, director of vocational education in Massachusetts. In his very interesting talk, Mr. Small traced the development of vocational education in Massachusetts, and especially the part played by Mr. Charles R. Allen in the early days. Mr. Small then introduced the speaker of the evening, Dr. Charles R. Allen of the Federal Board for Vocational Education. Dr. Allen took as his subject, "Efficiency in Vocational Education," covering the field in which he has worked for the last few years and which is culminating in a book to be published in the near future. Dr. Allen holds that vocational education must be checked up from time to time, just as business is checked up by the efficiency engineers. He showed that there are factors by which a system of state schools or individual schools or departments must be evaluated, factors which must be presented before group conferences of the directors or educational boards and the school or department measured against each factor. He pointed out that the curve of efficiency to be graphed as a result of the study, clearly shows where the weak places are and just where the best work is done. From this curve, the directors and supervisors are shown exactly where their efforts are most needed. The objectiveness of the factors and the uniqueness of the method met a favorable reception on the part of the members present.

Following a question period, an entertainment was given, after which a number of souvenirs were distributed. The society has printed an up-to-date roster of its members, together with its constitution and by-laws. It is in existence since 1897 and is probably one of the oldest organizations of its kind in the country.

INDUSTRIAL-ARTS CLUB ORGANIZED AT ENID, OKLAHOMA

The industrial-arts teachers of Enid, Okla., have organized a luncheon club as a means of promoting better understanding and creating the best teamwork among the departments of the schools. The club meets the first Saturday of every month for the discussion of problems of particular interest to the teachers.

The club has elected Mr. M. G. Sears, director of vocational education, president; Mr. W. S. King, teacher of woodworking in the high school, secretary; and Mr. N. M. Connett, printing instructor in the high school, treasurer.

The members of the organization, other than the officers are: Mr. F. R. Arnold, teacher of automobile mechanics in the high school; Mr. M. S. Kirk, teacher of woodworking in the Longfellow Junior High School; Mr. Chester Pickel, teacher of mechanical drawing in the Longfellow Junior High School; Mr. Joe Ash, teacher of mechanical drawing in the Emerson Junior High School; and Mr. Roy Hollar, teacher of woodworking in the Emerson Junior High School.

PENNSYLVANIA VOCATIONAL ASSOCIATION ELECTS OFFICERS

The Pennsylvania Vocational Association, at its recent annual meeting held at Reading, elected officers for the year following the annual dinner. The officers are:

President, Miss Margaret Glossner, West Chester; vice-presidents, Dr. Gerald D. Whitney, Pittsburgh, Ray Cole, Bloomsburg, Harry K. Balsbaugh, Harrisburg; secretary, Mr. V. A. Martin, Harrisburg.

Dr. Whitney, who presided at the sessions, praised the splendid service of Mr. C. E. Hedden, the secretary, who announced his removal to another state. Mr. Hedden was presented with a fine brief case in appreciation of his work.

The position of editor of the Pennsylvania Vocational Education News, the association paper, which was made vacant by the appointment of Mr. Martin to the secretaryship, will be filled at a later date.

VOCATIONAL TEACHERS OF NEW YORK STATE HOLD INTERESTING MEETING

The vocational teachers of New York State held their annual meeting in connection with the State Teachers' Association at New York University, Albany, N. Y. Mr. E. P. Chester, of New Rochelle, acted as chairman of the meeting.

At the meeting, splendid talks were given by Mr. Oakley Furney, supervisor of part-time education for the state, and by Dr. David Snedden of Teachers College, Columbia University. In his talk, Mr. Furney traced the advancement of vocational education in the state, giving special emphasis to the evening trade-extension work and to the day and evening apprentice classes. In the foreman-training work, a total of 3,900 foremen are taking courses offering opportunities for advancement as leaders and teachers in their respective plants. He also stated that 49,500 industrial plants in the state are

employing three or more persons actually engaged in the manufacture of some product. The manufacture of clothing is the largest field represented and here very little has been done to educate persons for work in the field of garment making.

Dr. Snedden, who followed, talked on "The Place of the Trade School in Society," pointing especially to the need of specific training for every child in order to fit him for the world's work. Dr. Snedden predicted that in the future, school authorities will not worry about the vocational education of the 14- to 16-year-old pupils for they will be going to the general education school for a longer period of time, and probably until they reach the age of 18. It means that specific vocational education eventually will not begin until after graduation, just as is now the practice in the medical and dental schools. The present trend appears to be against the employment of the youth due to the laws which protect the immature child. Dr. Snedden contended that future vocational schools will be specific trade schools, turning out students capable of productive work in a practical way. The strictly trade work would be supplemented with related work of a technical nature, as well as English, hygiene, and civics, so that vocational training would prove of great value to the mature students. To make the vocational work of the greatest possible value in a trade way, Dr. Snedden contends that the states must establish school for the different trades, such as carpentry, printing, and electricity. Each school would draw its students from a wide area and would have facilities for housing the students.—*E. W. Manzer.*

INDUSTRIAL ARTS AT THE OHIO STATE CONFERENCE

A number of prominent educators will discuss topics of educational importance at the meeting of the Ohio State Educational Conference, to be held April 4 to 6, at Columbus. Among the speakers will be Mr. G. A. Beneker, of Cape Cod, Mass., who will talk on "Art and Education," and "Art and Industry," and Mr. Arthur B. Mays of Urbana, Ill., who will discuss "Changing Relationships in Industrial Arts and Vocational Education."

THE WISCONSIN VOCATIONAL ASSOCIATION ELECTS OFFICERS

The Wisconsin Vocational Association elected the following officers at its meeting during the convention of the Wisconsin Teachers Association at Milwaukee on November 8, 1928.

President, O. J. Dorr; secretary-treasurer, H. C. Thayer.

The executive committee for the coming year consists of the following; Local director, E. C. Comstock; trade and industry, H. P. Hurley; rehabilitation, Harold V. Harvey; teacher training, Regina Groves; general subjects, Grace Colkins; home economics, Ruth Kleist; commercial, H. M. Winkel; coordinator, Mr. Carpenter.

NEW OFFICERS OF SOUTHERN ARTS ASSOCIATION

The Southern Pennsylvania Arts Association has elected officers for the year 1929. The officers are: President, Mr. A. P. Orth, Harrisburg; vice-president, Mr. Ola McLean, Lancaster; secretary, Mr. F. C. Burris, Harrisburg.

Elementary Printing Job Sheets

By Ralph W. Polk. In loose-leaf binder. 110 pages. Price, $1.28. Manual Arts Press, Peoria, Ill.

This material provides laboratory exercises for a first-year printing course of secondary-school grade. The jobs are, in part, study assignments, in part, practice assignments, and in part, projects to be set in type and printed. The sheets are detailed and complete; the projects are carefully studied for difficulty, time, and use of the essential principles and processes. The sheets themselves are handy in size and quite typical of high-grade textbook typography.

Junior Food and Clothing

By Kate W. Kinyon and L. Thomas Hopkins. Cloth, 416 pages. Benj. H. Sanborn & Co., Chicago, Ill.

This text for junior-high-school classes in home economics emphasizes basic information, health attitudes and habits, and an understanding of the economics, esthetics, and practical skills of the wise selection and use of foods and clothing. Schools which offer daily laboratory work will find ample material for a year's study.

The Airplane and Its Engine

By Charles Hugh Chatfield and Charles Fayette Taylor. Cloth, 329 pages, 5½ by 8, illustrated. Price, $2.50. Published by McGraw-Hill Book Co., New York, N. Y.

This book will be welcomed by the inquiring reader who wants to know something of the technical side of the airplane. The book is well illustrated and should find wide acceptance by the schools who are including a course in aeronautics in their curriculum.

The subject matter is dealt with in 17 chapters under the following headings: The Essential Parts of the Airplane; The Wing; Airfoil Modifications and Arrangements; Parasite Resistance, Fuselage and Landing Gear; Stability and Control; The Airplane Engine; The Propeller; The Complete Power Plant; Airplane Performance; Airplane Maneuvers; Airplane Construction; The Seaplane and the Amphibian; The Commercial Airplane; Military Airplanes; Special Types of Airplanes; Aircraft Instruments and Accessories.

How to Wind D. C. Armatures

By W. E. Hennig. Cloth, 205 pages, 6⅞ by 10, illustrated. Price, $3.00. Published by The Bruce Publishing Company, Milwaukee, Wis.

This is the second revised edition of this valuable textbook. The author is a man who has had both practical and teaching experience. The book which originally was based on the material which he used in his classroom lectures, in its newly revised form, contains a number of material changes and additions.

It takes up in a concise but simple manner, the ordinary types of winding, shows how armatures may be tested, and how they may be rewound for changed conditions. The appendix contains a great deal of useful information, formulas, and tables. The book has been made as simple as possible so that it may be used by the man who has not had much mathematics. At the same time, it is thorough enough that the university student will find it very helpful.

Block Printing in the School

By William S. Rice. Paper, 43 pages, 7½ by 10, illustrated. Price, 88 cents. Published by The Bruce Publishing Company, Milwaukee, Wis.

This small book gives in a very brief but yet complete form the historical and practical information required by the beginner who wants to practice the ancient art of block printing. The tools and materials that are required, little helpful kinks and appliances, the kind of ink and color to use, the method of putting on the ink or the color, all of these are described not only in words, but also by illustrations so that the amateur has no trouble in following the simple directions.

There are several beautiful full-page cuts, exemplifying how this art can be used for various purposes. The low price of the book ought to make it a great favorite in the school where this subject is taught.

Objective Tests

By J. S. Orleans and Glenn A. Sealy. Cloth, 374 pages, 5¼ by 7¾, illustrated. Price, $2.20. Published by The World Book Company, Yonkers-on-Hudson, N. Y.

The authors outline the methods to be followed in organizing the teachers in an educational system to take up the study and the production of objective tests for the purpose of applying educational measurements, for instructional, administrative, and supervisory purposes. The different types

(Continued on Page 28a)

NOW, ARE THERE ANY QUESTIONS?

Refinishing Old Maple Furniture

860. Q.: Kindly give me directions for cleaning, bleaching, and refinishing an old maple bed, chair, etc.—*M. C.*

A.: Old maple is best cleaned with a high-grade varnish remover and steel wool, No. 2. Finally wash thoroughly with rags saturated with denatured alcohol. Let dry and sand clean and free of all scratches. Bleaching should not be used, generally speaking, on antique maple. The color most sought after is a deep golden yellow with a brown overtone. Make all repairs, sand clean and bright to fresh wood if necessary to get a good surface. Apply a coat of diluted water stain of so-called "Amber Maple." Let dry, and then give a thin coat of orange shellac, applied with a soft bristle brush, after diluting four pound stock with an equal amount of denatured alcohol. Let dry and sand clean with a split 6/0 paper until glass smooth. If desired to even up the tone of the work, give a second coat of diluted shellac which when dry can be resanded and then varnished, with as many successive coats as desired. The last coat should be rubbed dull with FFF pumice flour, crude oil and rubbing felt. Carvings or deep turnings should be rubbed with a stiff bristle rubbing brush dipped in the oil and pumice stone. Clean up with fresh rags. In case the water stain is not available, I have found that a very acceptable stain can be made by adding four tablespoonsful of asphaltum varnish, turpentine type, to one quart of gasoline, together with one ounce of turpentine and one teaspoonful of japan dryer. This should be applied freely with a wide brush working from the top down so that a free flowing effect is obtained minus sags or drip lines. Let dry in a warm room for at least 48 hours to insure complete hardening of the asphaltum which sometimes is quite slow. Then proceed with the subsequent shellac treatments.—*Ralph G. Waring.*

Estimating Concrete Work

861. Q.: We have some students enrolled in our night classes who are desirous to secure some practical literature on cement and concrete work that treats on the estimating of bids, building forms, reading of concrete blue prints, the kind and amount of steel and reinforcements for different buildings, etc. Can you send me a bibliography that might help form a private library for these students? They understand the practical working of concrete—some of them having worked at the trade for three years—but they wish to enter the field of bidders and contractors, setting up a business of their own.—*D. F. O.*

A.: You may find what you require among the following books:

Materials of Construction. By H. E. Pulver. Published by McGraw-Hill Book Co., New York, N. Y.

Reinforced Concrete Construction. By Hool. Price, $6. Published by McGraw-Hill Book Co., New York, N. Y.

Architectural Design in Concrete. By T. P. Bennett. Price, $10. Oxford University Press, New York, N. Y.

Concrete Building Construction. By T. Crane. Price, $6. Published by John Wiley & Sons, New York, N. Y.

Concrete of the Architect and Sculptor. By J. J. Earley. The Portland Cement Association, 33 West Grand Ave., Chicago, Ill.

How to Make Forms for Concrete Buildings. By W. F. Lockhart. Price, $1. Concrete, 139 North Clark St., Chicago, Ill.

Concrete Construction for Architects. By D. W. C. Pond. Price, $4. Published by Charles Scribner's Sons, 597 Fifth Ave., New York, N. Y.

Design of Concrete Structures. By L. C. Urquhart and C. E. O'Rourke. Price, $4. McGraw-Hill Book Co., New York, N. Y.

Standard Specifications for Concrete and Reinforced Concrete. Price, $1.50. Published by the American Society for Testing Materials, 1315 Spruce St., Philadelphia, Pa.

Handbook of Design for Steelcrete Mesh. The Consolidated Expanded Metal Companies, Braddock, Pa.

Useful Data on Reinforced Concrete Buildings for the Designer and Estimator. Price, $2.50. Matthews Northrup Works, Buffalo, N. Y.

Tests of Reinforced Concrete-Slab Beams. By W. A. Slater and F. B. Seely. 15 cents. Superintendent of Documents, Government Printing Office, Washington, D. C.

Reinforced Concrete. By W. L. Webb and W. H. Gibson. $2. American Technical Society, Drexel Ave. and 58th St., Chicago, Ill.

Concrete Engineer's Handbook. $1. John C. Winston Co., 1006 Arch St., Philadelphia, Pa.

Concrete-Steel Construction. By Eddy and Turner. Price, $10. Published by C. A. P. Turner, 627 First Ave., N., Minneapolis, Minn.

Concrete Engineer's Handbook. Hool. Price, $5. McGraw-Hill Book Co., New York, N. Y.

Tests of Bond Resistance Between Concrete and Steel. By W. A. Slater. Price, 25 cents. Superintendent of Documents, Government Printing Office, Washington, D. C.

Principles of Reinforced Concrete Construction. By F. E. Turneaure and E. R. Maurer. Price, $3.75. John Wiley & Sons, New York, N. Y.

Useful Data on Reinforced Concrete Buildings for Designers and Estimators. Price, $2.50. Corrugated Bar Co., Mutual Life Building, Buffalo, N. Y.

Estimating Concrete for Buildings. By C. W. Mayers. Price, $1. Aberthaw Construction Co., Boston, Mass.

Standard Reinforced Concrete Charts for Columns, Beams, and Slabs. By H. B. Andrews. Price, $5. Published by H. B. Andrews, Boston, Mass.

Unit System of Reinforced Concrete Building Construction. By W. N. Ellis. Price, $3. Courier Co., Zanesville, Ohio.

Engineer's Pocket Handbook of Reinforced Concrete. By E. L. Heidenreich. Price, $3. M. C. Clark Co., 608 South Dearborn St., Chicago, Ill.

Strength of Reinforced Concrete Beams. 1912. By R. L. Humphrey and L. H. Losse. Price, 50 cents. Superintendent of Documents, Government Printing Office, Washington, D. C.

Building Superintendence for Reinforced Concrete Structures. By O. L. Post. Price, $1. American Technical Society, Chicago, Ill.

Reinforced Concrete Wall Footings and Column Footings. 1913. By A. N. Talbot. Price, 50 cents. University of Illinois, Urbana, Ill.

Kahn System of Standards for Reinforced Concrete Buildings. 1913. Price, 50 cents. Published by the Trussed Concrete Steel Co., Detroit, Mich.

Examples of Mushroom System of Reinforced Concrete Construction. By C. A. P. Turner. 1912. Published by C. A. P. Turner, 816 Phoenix Building, Minneapolis, Minn.

Tests of Reinforced Concrete Columns. By M. O. Withey. 1911. Price, 40 cents. University of Wisconsin, Madison, Wis.

Turner Mushroom System of Cantilever Flat-Slab Construction. By E. T. Flaherty. 1913. Price, 25 cents. Engineers and Architects' Association, Southern California. Mr. H. Z. Osborne, City Engineer's Office, Los Angeles, Calif.

Design of Engineering Structures. By G. S. Thompson. Price, 75 cents. Published by the Allen Book Company, 454 Fulton St., Troy, N. Y.

General Specifications for Concrete Work as Applied to Building Construction. W. J. Watson. Price, $1. McGraw-Hill Book Co., New York, N. Y.

Galley Proof Press

862. Q.: Our printing department, not being able to afford to purchase a galley proof press, wishes to make one. Can your question department tell us where any information on this subject can be found, especially where one can purchase the kind of felt necessary to cover the roll?—*E. K. F.*

A.: You do not state what facilities you have at hand in your school. No doubt, however, you have a woodworking lathe and probably even an engine lathe.

(Continued on Page 33a)

Instructors of Metal Working

Combined
A Drill Press *and a* Portable Drill

COMBINED, the Stanley Electric Drill and Drill Press make an efficient and economical piece of shop equipment—for all kinds of bench drilling in sheet metal.

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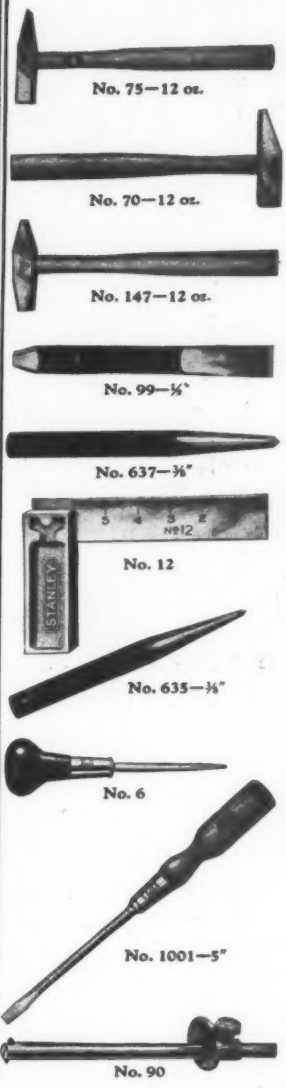

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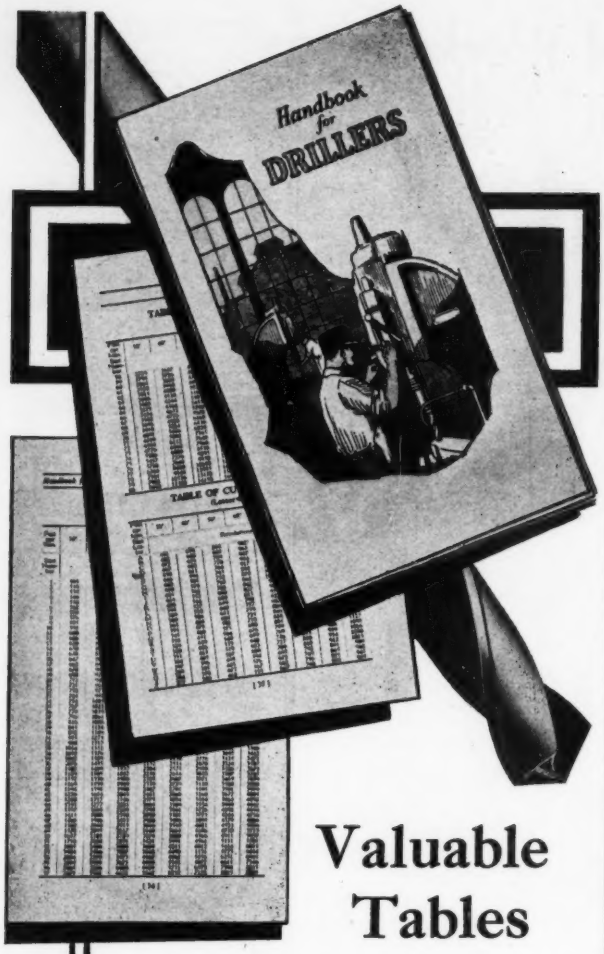


Valuable Tables

In addition to fulfilling its primary job as the leading textbook on twist drills and drilling practice, the "Handbook for Drillers" contains several valuable tables of Cutting Feeds and Speeds. These tables are in constant daily use in hundreds of the largest machine shops in America.

Copies of the "Handbook," in any reasonable quantities, will be furnished free to supervisors and instructors of industrial and vocational education for use as textbooks by students in machine shop practice.

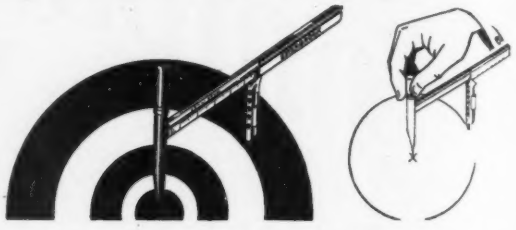
The CLEVELAND TWIST DRILL COMPANY CLEVELAND
NEW YORK-CHICAGO-LONDON SAN FRANCISCO
TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

School Shop Equipment News

For the Supervisor and Teacher who desires to keep abreast with news of new Machinery, Tools, Supplies, etc.

ANNOUNCE NEW ESTERBROOK COMPASS

The Esterbrook Steel Pen Company of Camden, N. J., has announced the marketing of its new steel compass, a low-cost precision instrument intended for the use of drawing teachers, students, artists, and engineers.



The Esterbrook compass is entirely rustproof, being made of nonferrus metals, with the post and beam of zinc alloy, and the slide of German silver. It is guaranteed to hold a regular compass lead without breaking, or allowing it to become loose or lost. The compass is particularly suited for mechanical-drawing work and is capable of performing from 75 to 80 per cent of all compass work.

NEW MOTION-PICTURE FILM ON ARC WELDING

An educational motion-picture film on arc welding has been announced by the Lincoln Electric Company of Cleveland, Ohio. It is entitled "Modern Manufacture with a Stable Arc Welder," and depicts the physical characteristics and costs of cast iron and rolled steel, as well as of cast iron, riveted steel, and arc-welded steel construction. The various applications of welding are shown, in addition to designs for welded-steel construction, and a history of the commercial uses of welding to the present time. The picture is arranged in three reels of standard-size film and is adaptable to large or small audiences. It is offered gratis.

PEASE COMPANY OPENS PACIFIC COAST OFFICE

In order to meet the rapidly increasing distribution requirements for drafting-room and blue-printing supplies, the C. F. Pease Company, of Chicago, has opened a Pacific Coast sales office at 501 South Spring St., Los Angeles, Calif. The office will be under the direction of Mr. Ralph S. Gibson, western sales manager of the firm.

NEW PUBLICATIONS

(Continued from Page 127)

of test questions are discussed and directions are given for making and arranging these questions for actual tests.

The simple mathematics of arriving at the medians, working out the subject grade tables, and interpreting the test results, are given. This book should prove helpful to anyone who wants to take up the study of the newer type of test.

The Shuttle-Craft Book of American Hand-Weaving

By Mary Meigs Atwater. Cloth, 275 pages, 7⅜ by 9⅞, illustrated. Price, $6.50. Published by The Macmillan Company, New York, N. Y.

The student who is taking up weaving and the amateur weaver will be delighted with this book. It is beautifully illustrated, interestingly written, and contains a great number of weaving designs.

Junior Home Problems

By Kate W. Kinyon and L. Thomas Hopkins. Cloth, 214 pages, 5 by 7, illustrated. Price, $1.00. Published by Benj. H. Sanborn & Co., Chicago, Illinois.

This interesting little book outlines a number of problems which the girl of junior-high-school age can take up in her

(Continued on Page 30a)

Push....

and the screw spins home

MILLERS FALLS TOOLS SINCE 1868

Millers Falls No. 61 takes the *work* out of screw driving. Simply center blade end into slot.....and *push*. Speed up work? You bet it does.

No. 61 plays many rolls on call.

Automatic: - right or left action; Ratchet: - long or short screw driver, right or left action. Rigid: - long or short as you wish.

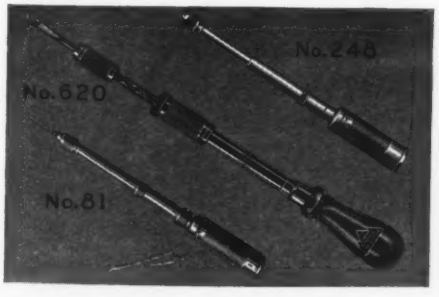
Changes are made by a half turn of knurled sleeve — that takes half a second. Drill points, too.....fast workers. Slip out the blade. Substitute chuck, and drill points in eight diameters are ready to go to work.

Soft wood, hard wood, wall board, plaster.....all look alike to these Millers Falls Drill Points. They put clean holes through all or any.....without splitting or cracking.

Three sizes, 9⅜", 14¼" and 17¼" long, closed. Each with three blades. Hardwood handles; spiral nuts of manganese bronze [wear for years].

Like all Millers Falls Tools, built by toolmakers to give first class service for a good part of your lifetime. Better tools mean better work.

If it's Millers Falls, you're sure of the quality. At your hardware store, look for the Millers Falls trade-mark below. Free to manual training students — handbook of tools. Write for it.



Automatic Drills

These Millers Falls automatic drills have magazine handles to keep drill points safe. Turn knurled nut on end of handle and handle slips down over frame exposing points, each in its individual compartment. Spiral Nuts are of Tobin bronze for long wear. No. 81 is 10½" long. No. 248 is 10¼" long.

No. 620 Spiral Ratchet Automatic Return

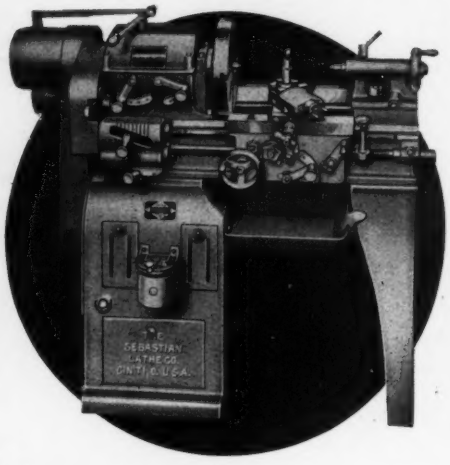
Push .... and handle returns for the next stroke. Fine for drilling in narrow places where you can't hold the chuck. 3 sizes—8⅛", 12⅝" and 16⅛" closed. With 3 blades. Chucks and drills available.

MILLERS FALLS COMPANY MILLERS FALLS, MASSACHUSETTS

NEW YORK: 28 WARREN STREET CHICAGO: 9 SOUTH CLINTON STREET

Do This!

If you want absolute satisfaction for the money you spend for SCHOOL LATHES



Incorporate these specifications in your next request for bids—

(....) Lathes Gold Seal or equal—Swing 11", bed length 4', to be 8 speed geared head, full quick change box with no loose gears, to cut threads 3-96, feeds .007 to .156, all steel gears, 1 5/16" hole through spindle, collet capacity 7/8", bearings of main spindle 2 3/16x2¾ —1 1/16x2¼", to be taper gibbed throughout, motor drive with motor fitted in leg under headstock with a tool cabinet in the leg below the motor compartment, tumbler yoke for cutting left-hand threads with the depth of the teeth already adjusted on the quadrant for throwing over to a left-hand thread, lathe to be bronze bushed wherever required. Macit tool post screw. Silent chain drive with easy adjustment for stretch in the chain, lathe to be fitted with a safety shearing pin, graduated compound rest and tailstock bases, tailstock center oiler, friction type collars on compound rest and cross feed with these collars graduated, accuracy alignment test .0005, motor and control to be (Specify here type current and type of control wanted). Each lathe to be furnished with a chip pan, depth thread chasing stop, centers, thread chasing dial, steady rest, and wrenches. The lathes shall all be furnished with all gears guarded by cast iron guards, and the operation of the lathe for stop and start shall be through a friction on the headstock controlled by a lever within easy reach of the operator so that the motor can run constantly when machine is in operation. The apron of the lathe shall have a safety device to prevent both longitudinal feeds being thrown in at the same time.

Add here list of extras wanted such as, Chucks, Taper Attachment, Draw-in Attachment, Collets, Tools, Dogs, etc.

THE SEBASTIAN LATHE CO.
CINCINNATI, OHIO
NEW YORK OFFICE—Room 372—50 Church St.

(Continued from Page 28a)

own home. These problems tie up the schoolwork with actual family life.

It is divided into seven chapters in which the following questions are answered for the student: What are the personal responsibilities of girls in making their home and family life successful?; What does it cost to finance the home?; How can you help mother in housekeeping in your home?; What must you know in order to help with the care of younger children in your home?; What must you know in order to be helpful when there is illness in your home?; How can you help to make your home friendly, hospitable, and entertaining for your family and guests?; and What is your relationship and the relationship of your home to the community?

A number of questions and suggestions for pupils at the end of each chapter, together with reading references for pupils and teacher make the book valuable from the student's as well as the teacher's standpoint.

Gordon Progressive Plan Book

Arranged by A. W. Gordon. Paper, 8⅜ by 10¾. Published by The Bruce Publishing Company, Milwaukee, Wis.

This book consists of well-arranged forms which the teacher can fill out with his or her daily lesson plans. It is a convenient way for the teacher to keep a record of lesson plans which have been worked out and used. The book is arranged so that it may be kept up to date with a minimum of effort. It also puts the work taught in a given class in such shape that it can be readily referred to by the supervisor or by substitute teachers who perchance have to carry on when the regular teacher is absent.

Strengthening a Nation: A Brief Course in Social Science for Part-Time Schools. Bulletin No. 223A, November, 1928. Issued by the Michigan State Board for Vocational Education, Lansing, Mich. The bulletin presents a series of lesson plans and lesson sheets in social science, the object of which are to stimulate the minds of young people to the importance of citizenship in its broad sense. The material gives the child an idea of the cooperation necessary between labor and capital and provides a fitting link between education and progressive occupations leading out of the "dead end" job. Each of the lessons represents a complete unit and the material in its present form is intended to form several related yet complete unit lessons.

Private and Endowed Schools Offering Trade and Industrial Courses. By M. M. Proffitt. Bulletin No. 18, 1928, of the U. S. Bureau of Education, Washington, D. C. A list of schools in the form of a directory, giving courses, names of schools, and a brief outline of the work offered in trade education and industrial-arts work.

Report of the United States National Museum for 1928. Paper, 216 pages. Issued by the Smithsonian Institution, Washington, D. C.

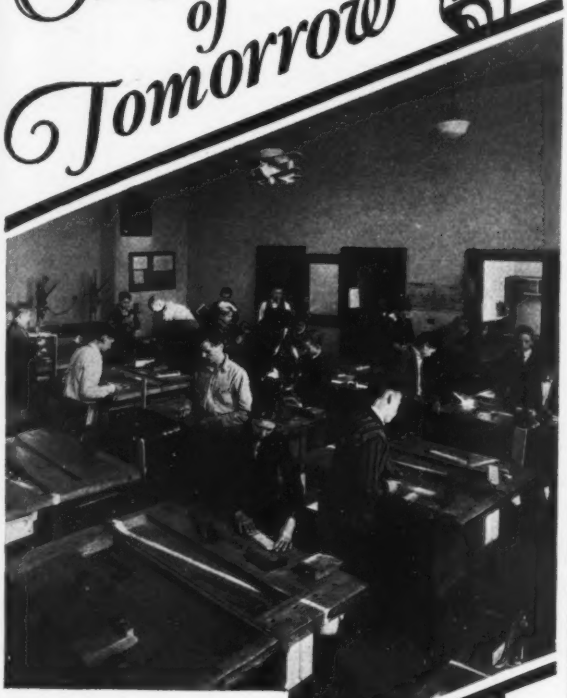
Great Masters of Music. Paper, 50 pages. Issued by the McKinley School, Newark, N. J.

The Vocational-Guidance Task of the General Continuation School, New York City. Prepared by F. J. Keller. Paper, 20 pages. The pamphlet gives the purpose of the continuation school, shows the need for vocational guidance in a continuation school, the organization of the school, the teacher's relation to the counseling program, and the complete guidance task.

Eighty-fifth Annual Report of the Detroit Public Schools. Paper, 158 pages. A very excellent report showing the progress of the schools during the year 1927-28, covering such topics as building, finance, administration, vocational education and similar phases of schoolwork.

Annual Report of the Director of Reference, Research, and Publicity, St. Louis, Mo., for the year ending July, 1928. A report of a conference concerning a survey of vocational education in St. Louis, giving a statement of the problem, an analysis of the immediate problem, and the working conditions necessary to make the program effective.

Craftsmen of Tomorrow



How eager they are to obtain your praise for good work! How joyful when you say, "Well done"! These future craftsmen are guided by the standard you set. Their craftsmanship is limited or advanced by the tools furnished them.

Genuine Irwin solid center Auger Bits are the choice of craftsmen of today.

Irwin Bits for Industrial Arts Schools make your job easier—they bore clean, finished holes. They stand up under hard use. Write for special charts for manual training use, also booklet, "How to Select, Use and Care for Bits."

THE IRWIN AUGER BIT COMPANY
Wilmington, Ohio

The IRWIN Bit
THIS BIT IS GUARANTEED TO DELIVER SERVICE
YOUR DEALER STANDS WITH US BEHIND IT
ASK HIM FOR BOOKLET "HOW TO SELECT USE AND CARE FOR BITS"
THE I.A.B.CO.
WILMINGTON O.

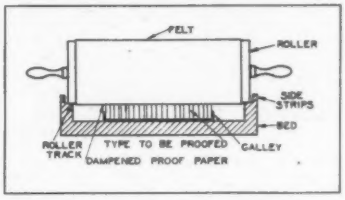
The IRWIN Bit

IRWIN Auger Bits

NOW, ARE THERE ANY QUESTIONS?

(Continued from Page 128)

If you have only the woodworking lathe, you might have someone turn up a glorified wood rolling pin, possibly 6 to 8 in. in diameter and a foot long, with two handles on the end, as shown in the accompanying illustration. This rolling pin might be made heavier by drilling holes into it which could be filled with lead or with iron bars. The felt with which to cover the roll, can be bought from the American Type Founders Co., 300 Communipaw Avenue, Jersey City, N. J., or from Barnhart Brothers & Spindler, Monroe and Throop Streets, Chicago, Ill. To use this galley proof roller, would require a very staunch bed. It might probably be



made of lumber, but it would have to be made quite rigid with side cleats upon which the roller would track. It should also be provided with protecting strips which would prevent the rollers from running off sidewards. The track upon which the roller runs, by the way, must be made so that it is type high plus the thickness of the metal between the galley, plus half the thickness of the felt.

If you have access to an engine lathe, you might probably be able to make a very acceptable roller out of a piece of 6- or 8-in. wrought-iron pipe of suitable length. A piece of $\frac{5}{8}$-in. pipe could be used for a handle and the space between the handle and the larger pipe might be filled with concrete or any other heavy material, in order to give additional weight to the roller. Probably, however, you may be able to interest some printers in your town sufficiently to have them donate one of these old-type galley proof presses to you, or you may probably be able to buy a secondhand galley proof press through the American Type Founders Company, or through Barnhart Brothers & Spindler.

AMONG the INDUSTRIAL ARTS TEACHERS

Mr. E. C. Comstock, formerly director of vocational education at Stoughton, Wis., has accepted the position of state supervisor of trade and industrial education in Alabama. Mr. Lyman Funkey, of Fond du Lac, has succeeded Mr. Comstock at Stoughton.

Mr. Albert L. Colston, principal of the Brooklyn Technical High School, Brooklyn, N. Y., was elected president of the newly formed Association of Technical High Schools and Institutes at its recent convention in Detroit.

Mr. Franklin H. Gottshall, formerly director of industrial arts at the Mount Berry School for Boys, Mount Berry, Ga., has been appointed director of industrial arts at Mount Berry College.

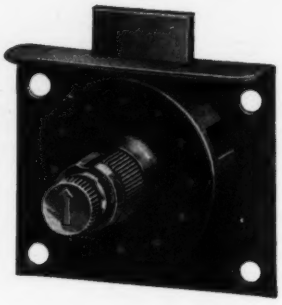
Mr. C. E. Hedden, formerly on the industrial staff of the vocational division of the Pennsylvania state education department, has been appointed supervisor of plan training in the Mohawk Carpet Mills at Amsterdam, N. Y. Previous to his appointment on the staff of the state department, Mr. Hedden was city director of vocational education in Altoona. His splendid work was recognized at the Reading dinner meeting of the Pennsylvania Vocational Association when he was presented with a fine brief case.

Mrs. Edith D. Davison has been appointed to serve as editor of the Vocational Education News, the association paper of the Pennsylvania Vocational Association. Mrs.

(Continued on Page 34a)

HERE IT IS!—Just What You Have Been Waiting For

Dudley K-1 Cabinet Lock



YOUR KEY PROBLEM CAN NOW BE SOLVED

In your Manual Training, Mechanical Drawing, Drafting departments and shops—wherever a cabinet key lock is now used, whether desk, table, drawer, or bench—

A BRAND NEW TYPE OF LOCK

Just as the Dudley combination padlock has permanently solved the locker problem in the schools and colleges of America, just so the new Dudley combination cabinet lock is ready to solve the key problem in all other departments.

No more fussing with keys—no more keyboards—no keys to lose—no keys to forget—no more key expense—no master-key menace to fear. This new safe, pick-proof lock eliminates your whole key problem. It operates by touch—simply count the clicks and it opens in a jiffy—if you know the combination.

Insist on the new Dudley on your new equipment requiring cabinet locks of any kind. On your present equipment start right now replacing those troublesome key locks. The change can be made instantly and easily.

Can be furnished in sets having the same combination if desired.

Sample sent to any school executive for free examination. Send for it today.

DUDLEY LOCK CORPORATION

Dept. A-53

26 North Franklin Street, Chicago

(Continued from Page 33a)

Davison has been active during the past three years in building up the membership of the association and has regularly contributed news during this period. Mrs. Davison succeeds Mr. V. A. Martin, who resigned from the editorship to become secretary-treasurer of the association.

Mr. H. Hurn Diller, formerly in charge of the industrial education work at the New Jersey State Colony, has taken up his work as director of the continuation schools at Niagara Falls, N. Y.

Mr. Martin J. Dwyer has been appointed as administrative assistant to the Murray Hill Vocational School, New York City.

Miss Jane Close has been reappointed as director of sewing in the New York City schools for the next year.

Mr. Carlton Saecker has been elected president of the vocational school board at Appleton, Wis.

Mr. L. H. Funkey, of Fond du Lac, Wis., has accepted a position as director of the vocational school at Stoughton, Wis.

Mr. J. C. Wilcox and **Mr. Alvin Anderson** have been elected as members of the vocational school board at Menomonie, Wis.

Mr. Richard Bullimore, vocational instructor in the rural high school at Tonganoxie, Kans., died in a hospital at Lawrence, following an attack of influenza.

Mr. C. M. Miller, state director of vocational education of Kansas, was recently elected president of the National Association of State Directors of Vocational Education.

Shop-Sketching Class at Monett, Mo. The class in shop sketching and blue-print reading at Monett, Mo., has enrolled 24 students. The class meets two evenings each week and is being supported by the railroad officials who give it their fullest cooperation. Mr. F. A. Beyer, Jr., is the instructor.

NEWS AND NOTES

New York State Raises Requirements for Special Teachers. Under new rules of the board of regents of New York State, teachers of the special subjects in the secondary schools of the state, beginning with September 1, 1933, will be required to meet the same standard of professional and academic training now required of teachers of other secondary subjects, namely, four years of professional training leading to a bachelor's degree or equivalent, including eighteen hours of professional courses. The new requirements apply to teachers of such subjects as commercial work, home economics, physical education, music, drawing, and other special fields, except in industrial and vocational courses. By making the order effective in 1933, teachers in training are given ample time in which to plan their courses to meet the additional year required for those entering the service after that date.

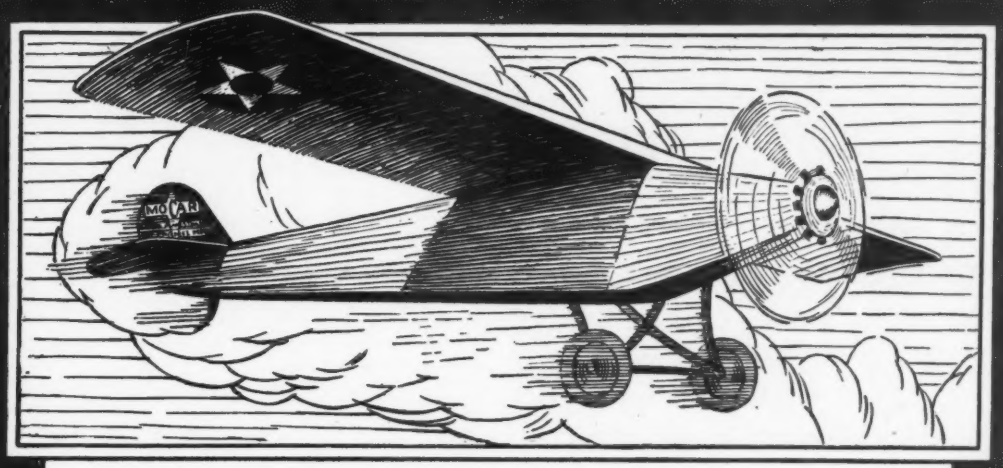
Plan New Vocational Courses at Richmond, Va. The school board of Richmond, Va., is cooperating with a committee representing the local chamber of commerce and other civic organizations in working out plans for technical and vocational courses in the high school.

New York Parents' Exposition to Contain Student Products. The board of education of New York City will conduct a machine shop, a daily newspaper, a home kitchen, a gymnasium, and other demonstrations of actual work in connection with the parents' exposition to be held during the week of February 23 to March 2, in the Grand Central Palace.

The exhibit, which will occupy an entire floor, will give parents an idea of the work being performed by their

(Continued on Page 36a)

The MOCAR



MODEL AIRPLANES THAT FLY, *For school groups*

Order Now for Spring Classes in Airplane Construction

"MOCAR" airplanes are especially made for manual instruction and school assembly work. For both city and rural schools, and manual training departments these planes fill the immediate demand for airplane building material. This is a true scale model.

All parts are made of aluminum and finished ready for assembly. No special tools or benches are needed, as only pliers are used for assembly. The work is easy and can be performed on ordinary school desks or in work shop. Simple instructions furnished. Complete in every detail.

When completed this plane will actually fly, taking off from the ground. It is strong—and will stand considerable abuse. Replacement parts are furnished at small cost.

Set No. L-100 illustrated ready for immediate delivery.

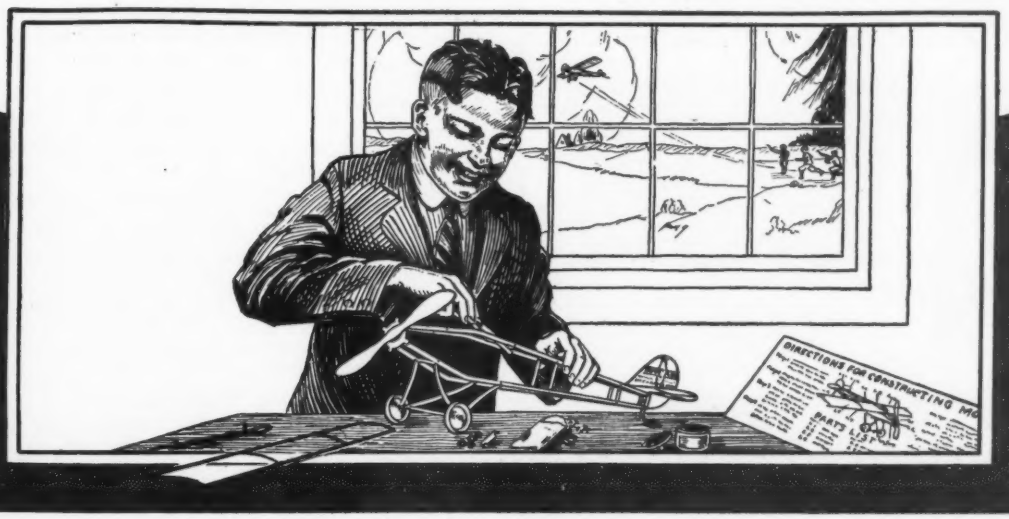
This is a practical, simply designed, real model plane that fills the urgent need for instructive airplane construction material *at a moderate cost*. Complete with rivets, bolts, wheels, wing and fuselage covering material, etc. Outfit mounted on cardboard ready to start work immediately.

It is well to remember that all *real* airplanes are first tested by making *models*.

Write immediately for full information to cover your requirements. Send $1.25 for sample postpaid, $1.10 each for six, $1.00 each in dozens, or your purchase order. Orders filled strictly in rotation.

Made By School Men For School Use

THE MOUNT CARMEL MFG. CO. Dept. H, New Haven, Conn.



Six Students-Six Drawers

Every student enjoys having his private drawer for his own belongings—here it is, in this very popular No. 225 Kewaunee Mechanical Drawing Table. Each drawer with individual key; also master-key. Compartment is shown on left side where drawing boards are stored.

This desk is used in many high schools, where it has won a well-deserved popularity. It is a good seller and it always satisfies.

We are manufacturers of a very complete line of Art and Mechanical Drawing Tables. Write for our complete Book of Illustrations.

Kewaunee Mfg. Co.
LABORATORY FURNITURE EXPERTS

See our specifications in BRUCE'S SPECIFICATION ANNUAL INDUSTRIAL ARTS & VOCATIONAL EDUCATION EDITION

Adrian Factory
C. G. Campbell, Pres. and Gen. Mgr.
Designers and Manufacturers of Art and Mechanical Drawing Room Furniture for Schools and Colleges
ADRIAN, MICHIGAN
1 End South Center St.

Instructor's Table No. 300
One of the very best and most satisfactory. Large working surface on top and adequate storage space below.

Kewaunee

(Continued from Page 34a)

children in the schools. The exhibit will include actual classwork, classes for adults in education, other forms of educational work, and will be in charge of Associate Superintendent Campbell and Mr. F. A. Rexford of the board of education.

It is expected that one thousand pupils of the public schools will be on the floor during the exhibit. There will be shops where actual work will be carried on, as well as classrooms for artistic and industrial activities. The domestic-arts department will conduct a model home for visitors, and there will be classes in hand sewing, and trade classes in machine sewing as it is performed in garment factories.

An Exhibit of Model Airplanes at Cincinnati. An exhibit of model airplanes was held recently in the music room of the Western Hills High School, Cincinnati, Ohio, under the direction of Mr. Homer Jones, leader of the airplane club of Withrow High School.

In the exhibit were three practical models which were demonstrated for the benefit of the teachers and students. As a means of promoting interest in the subject, there were sample kits, containing a complete assortment of parts for making a simple model.

The exhibit was held in connection with a departmental meeting of teachers of industrial arts, and included discussions of plans leading to a revision of the courses in industrial arts.

Vocational Funds Approved by House of Representatives. The revised vocational-education bill, providing for an aggregate of $2,500,000 of additional funds to be spread over a five-year program, was approved by the House of Representatives on January 28. The amended bill provides for an initial appropriation of $500,000 for the fiscal year ending June, 1930, and for each thereafter, for four years, a sum exceeding by $500,000 the sum appropriated for each preceding year.

The appropriations under the terms of the bill, which now goes to the Senate for approval, will provide for extensive work in agriculture and home economics, with requirements for similar cooperative appropriations by the several states. These appropriations will be in addition to those made for vocational education under the law of February 23, 1917.

The curtailment of the additional appropriations by the House means that at the end of the five-year program, the sponsors of additional funds for the purpose must return to Congress for extensive legislation.

Manual-Arts Work at Farmington, Utah, Housed in New Addition. The new addition to the Central High School at Farmington, Utah, contains space for shops, art rooms, and an agricultural room.

Smith-Hughes Vocational Courses at Enid, Okla. More than 350 adults have enrolled in the Smith-Hughes courses at Enid, Okla., offering vocational training in trades and industries, home economics, and part-time work, under the direction of Mr. M. G. Sears, director of vocational work.

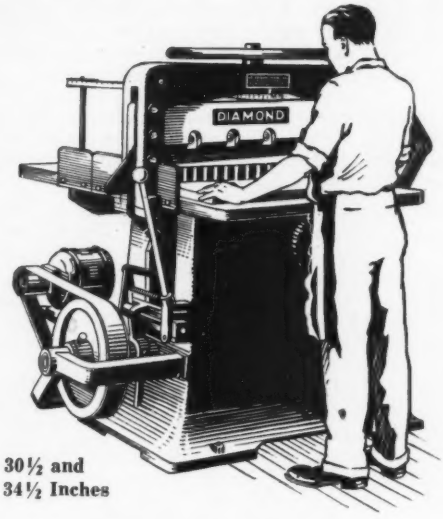
Of the three types of work included under the Smith-Hughes provisions, only two—home economics and trade and industrial education are offered in Enid. The trade and industrial classes draw their students from the employees of railroads, refineries, and public utility companies.

Among the courses offered are drafting and blue-print reading, janitorial engineering, principles of electricity, machine-shop practice, mathematics for refinery employees, locomotive valve and engine repair for railroad employees, and building construction for carpenters and bricklayers.

The local industrial plants have encouraged their employees to attend the classes because they realize that it makes their workmen more efficient and makes it possible for them to command a higher remuneration for their work.

Foreman Training at Williamsport, Pa. A program of foremanship training was recently conducted for the industries of Williamsport, Pa., under the direction of Mr. G. H. Parkes, director of vocational education for the city schools. A number of groups have received their certificates following

(Continued on Page 39a)



30½ and
34½ Inches

The Improved
Diamond Power
Paper Cutters

are Rapid, Powerful, Durable, Accurate, Convenient, Safe and Most Attractive

Diamond Cutters are also made as Lever Cutters to which Power Fixtures can be easily attached

Send for full information regarding Diamond Cutters and for literature describing any of the following machines and utilities used throughout the world in the Graphic Arts:

Advance Lever Paper Cutters
Lee Two-Revolution Cylinder Presses
Hoerner Combination Type-High Machine
Challenge Addressing Machine
Mercantile Addressing Machine
Sieber Adjustable Hand and Foot Punches
Challenge Proof Presses
McGreal Combination Printers' Chases
Challenge Labor-Saving Iron Furniture
Challenge Mammoth Iron Furniture
Challenge Notched Iron Furniture
Challenge Semi-Steel Imposing Surfaces
Challenge Pressed Steel Galleys
Challenge Rigid Rim Galleys
Challenge Iron Sectional Blocks and Hooks
Challenge Type-High Gauges
Challenge Quoins and Keys

Our Magazine "The Printers' Album" Sent Gratis on Request

The Challenge Machinery Co.
GRAND HAVEN, MICHIGAN
Chicago, 17-19 E. Austin Ave. New York, 200 Hudson St.

(Continued from Page 36a)

the completion of their training. One of the groups was composed of foremen from the woodworking industries, and a second group was composed of foremen from the textile industries. The foremanship program was conducted under the auspices of the chamber of commerce and in cooperation with the public-school system of Williamsport.

Annual Summer Conference at Eagles Mere, Pa. The annual state vocational conference of Pennsylvania will be held during the last week in June at Eagles Mere. Plans for the tentative program are already under way. The conference will deal with important problems incident to the development of vocational education in the state.

Aeronautics Class at Erie, Pa. A class in aeronautics was organized at the Central High School, Erie, Pa., on January 14, with a staff composed of Lieut. Harris, chief instructor, assisted by Mr. M. A. Martis, Mr. Joseph Miller, Mr. A. A. Becker, and Mr. R. H. Lohse. The course covers complete ground work and ten hours of flying. Motor courses and airplane mechanics are included in the program offered.

New Vocational-Guidance Program in Henry County, Ind. A constructive vocational-guidance program for the township schools of Henry county, Ind., has been arranged for the coming school year by the county board of education, assisted by Mr. J. H. Eilar, county superintendent.

Under the plan, Mr. S. S. Stout, of Jefferson township, Henry county, has been appointed as vocational counselor. Each school will offer one full year of vocational guidance and community civics in the ninth year, the counselor meeting with each class and others by special arrangement, four times each year. During each visit, the counselor will give a lecture with charts and diagrams at each session, which will be followed by special follow-up conferences during the remainder of the half day, giving tests as needed, charting characteristics of the individual pupils, and advising as to vocations. This is a new type of county-wide vocational service in Indiana and the results of the experiment will be watched with interest.

Shopwork on Exploratory Basis at Green Bay. The second term at the Green Bay, Wis., vocational school was opened in November, with the transfer of first-year students in the part-time division from one branch of shopwork to another. The change is in accordance with a new plan introduced by Director H. O. Eiken this year, calling for shopwork arranged on an exploratory basis.

Under the new plan, students are allowed to select the work in which they are interested. During the first year they are given their choice of the five subjects available, comprising electricity, sheet-metal work, carpentry, machine-shop practice, and printing.

University Extension Division of New York Offers Course for Continuation and Trade-School Teachers. The New York University Extension Division is offering this year the second year of a course on how to train personality for the benefit of personnel directors, vocational advisers, and teachers in continuation, trade school, and secondary schools.

Vocational Guidance at Akron, Ohio. A program of vocational guidance has been worked out at Akron, Ohio, under the direction of Mr. Miles E. Hawk.

Adopt New Qualifications for Principal of Continuation School. The board of superintendents of New York City has revised the by-laws relating to the qualifications of the principal of a continuation school by inserting an additional subdivision. Under the revised rules, the principal of a continuation school must have three years' experience as the principal of a New York City public school, provided such experience has included the supervision of industrial subjects, additional to homemaking or elementary-school shopwork or woodwork, and the completion of courses of 480 hours in the field of continuation-school education.

School Term. The board of education of St. Louis, Mo., has changed the terms of the vocational school in order to make better use of the school year. The first and second

(Continued on Page 40a)

Unusual

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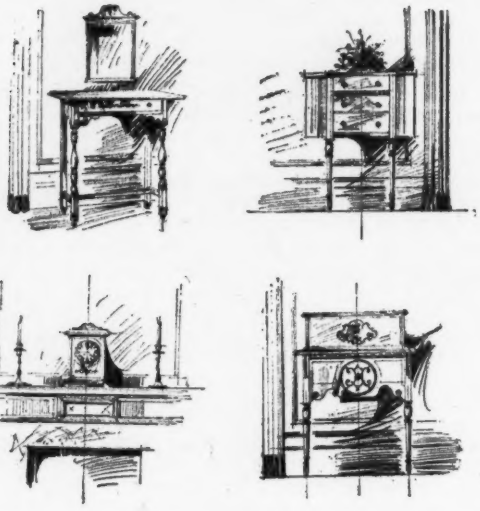
Opens new opportunities for Vocational Shops



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The "Book of Projects" is offered to vocational students and others at only One Dollar per copy.

Klise Manufacturing Company
Grand Rapids Michigan.

(Continued from Page 39a)

annual terms consist of 20 weeks each and the third term consists of 10 weeks. First and second terms coincide with those of the regular high schools, and the third term begins on the Monday following the close of the regular school year. The vocational school is in session 5 days per week, and sits from 8 to 12 o'clock. The daily sessions begin at 8 o'clock in the morning and continue until 5 o'clock in the evening. The school day for individual teachers consists of 5½ hours of actual schoolwork in addition to 30 minutes for luncheon which is allowed to all teachers and students.

Vocational Evening Courses at Madison, Wis. The vocational evening school at Madison, Wis., is offering a special course in machine-shop practice, which includes tool estimating and layout work, setting up, and projects in various production jobs. A general machine-shop course is offered, comprising work on the lathe, milling machine, planer, drill press, grinder, and bench and tool work. Practical demonstrations are afforded in heat tempering and treating, and the transforming of raw materials into finished products.

New Vocational School at Normandy. A new vocational school has recently been completed at the Normandy High School, Normandy, Mo. The building houses all the vocational-training shops, such as home mechanics, woodworking, auto mechanics, printing, drafting, dressmaking, cooking, and commercial subjects. A feature of the building is a model bungalow for homemaking classes.

Finishing Room at Covington, Ind. A finishing room for the drying of newly varnished furniture has been built in the manual-training department of the high school, Covington, Ind.

Trade-Extension Courses at Madison, Wis. The vocational school at Madison, Wis., is offering new trade-extension courses in mechanical drawing, blue-print reading, automobile mechanics, machine-shop practice, electricity, printing, sheet-metal work, cabinetmaking, plumbing, drafting for building trades, heating and ventilation, carpentry for apprentices, and painting and decorating.

New Vocational Courses at Virginia, Minn. New vocational courses recently introduced at the technical high school, Virginia, Minn., include automobile mechanics, cabinetmaking, drafting, electricity, arts and crafts, machine-shop practice, woodturning, sign lettering, sewing, cooking, bookkeeping, typing and shorthand.

Building-Trades Class. The building-trades class at Boonville, Mo., is housed in a new building this year. Mr. Morris, the instructor, has installed equipment for teaching electricity, sheet-metal work, and plumbing.

New Course in Vocational Agriculture for Iowa Schools. A new course in vocational agriculture has been prepared for Iowa high schools, under the direction of the state board for vocational agriculture, in cooperation with the agricultural education department of the Iowa State College.

Under the plan, unit agricultural courses covering the principal farm enterprises have been prepared for adult farmers and out-of-school boys. There are also courses for boys enrolled in the high schools.

New Rooms for Manual-Training Classes at Findlay, Ohio. The manual-training department at Findlay, Ohio, has occupied its new rooms. The rooms are well lighted and entirely suitable for the purpose.

New Vocational Classes at Kaukauna, Wis. The vocational school at Kaukauna, Wis., is offering new courses in patternmaking, sheet-metal pattern drafting, and automobile mechanics.

New York City Seeks Full-Pay Quota for Trade-School Staff. Associate Supt. J. M. Sheehan of New York City has begun a reorganization of the entire course of study for the city's vocational schools to conform with the state requirements and to obtain the full equalization quota of $1,700 toward the payment of salaries of the vocational teachers.

(Continued on Page 42a)

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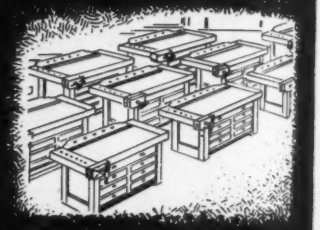

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(Continued from Page 40a)

Erect Workshop for Students. The board of education of Kearney, Nebr., will expend $20,000 for the erection of a manual-training workshop.

New Vocational Course at Niagara Falls, N. Y. A course in oxyacetylene and electric welding has been introduced at the Trott Vocational School at Niagara Falls, N. Y. The work will be in charge of Mr. B. J. Bird, a practical welder, who holds a government license.

Vocational School at St. Louis. The board of education has approved the plans for a vocational high school costing $3,250,000 on the site of the old Central High School. The building will comprise six separate units, each five stories high, and will house 4,000 vocational day students and 8,000 night-school pupils.

Apprentice Training for Marble Setters. The National Association of Marble Dealers, at their annual convention held recently at Peoria, Ill., voted to continue their cooperation with the University of Tennessee in supporting the apprentice-training school for marble setters. The course is given in intensive units of three months each, and each apprentice is given double time through an agreement with the national union governing the marble setter's trade. The school is being conducted under the direction of Prof. Clyde H. Wilson of the University of Tennessee, assisted by two instructors, Mr. Allen J. Brown and Mr. Paul Hilliard.

During the past four years, 91 boys from 19 different states have successfully completed the training course and have entered the trade as advanced apprentices.

Oppose Two Schools in One Building. The board of superintendents of New York City has opposed the housing of a vocational and a continuation school in the same building despite the fact that the board of education has begun the construction of a combined vocational and continuation school in Long Island City. The board of superintendents bases its opposition on the fact that the plan is inexpedient and inadvisable, except in a small community, because of the added cost and the congestion from two sets of pupils.

Among the reasons given for opposing the plan are: The merging of two sets of pupils and the use of the shops at the same time; the extreme height of a building requiring elevator service; the congestion about the building; the difference in the attitudes of the two groups of students; and the cost of construction.

New Class in Clay Modeling at Madison, Wis. A class in clay modeling has been started at the vocational school, Madison, Wis. The class has enrolled five students and is open to adults as well as vocational students.

New Equipment Installed at San Antonio, Tex. Special tools and machines for metal working have been installed in the shops of the Poe Junior High School at San Antonio, Tex. Equipment for an electrical shop has been installed at the Page Junior High School, and a mechanical-drawing department has been provided at the Harris Junior High School.

Automobile Mechanics for Women. A course in automobile mechanics for women has been begun at the vocational school, La Crosse, Wis. The course is intended for drivers and includes instructions on adjusting, oiling, greasing, and roadside repairs.

Plan Courses for Architectural Draftsmen in Portland. The Oregon chapter of the American Institute of Architects has appointed special committees to make a study of the advisability of establishing vocational-training classes in Portland for architectural draftsmen. It is the sentiment that there is need for more comprehensive instruction in architecture for students in the extension center of the state university.

Manual-Training Class Makes Improvements to Gymnasium. The manual-training class of the high school at Goodlettsville, Tenn., has carried out a project involving im-

(Continued on Page 45a)

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Director of Summer Session

Oregon State College **Corvallis, Oregon**

(Continued from Page 42a)

provements to the school gymnasium. The work comprised the improvement of the entrance, new ceiling and rewiring, screening of the windows, new lighting fixtures, and painting.

Will Erect New Building at Carrollton, Mo. A new workshop has been erected for the high school at Carrollton, Mo.

New Equipment for the Workshop at Chesterton, Ind. New equipment in the form of a band saw and a woodworking lathe has been installed in the high-school manual-training shop at Chesterton, Ind.

Build Poultry House at Goodland, Kans. The students of the high-school agricultural class at Goodland, Kans., have built a poultry house on the school grounds. The building is built on the straw-loft plan according to the best modern method.

Evening Vocational Courses at Waco, Tex. Evening vocational courses for men and women employed in the trades have been inaugurated at Waco, Tex. The courses will include electrical work, automobile mechanics, drafting and mathematics for the building trades, related science and mathematics for the electrical trades, and chemistry for nurses. Part-time classes will be conducted for persons employed in offices and stores.

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